

# AIRCRAFT PROFILE

229

## Vickers-Armstrongs Warwick variants

35p

by Norman Barfield, D.C.Ae., C.Eng., A.F.R.Ae.S., M.I.Mech.E., M.A.I.A.A.





## Editorially Speaking No. 6

THANK YOU! Unasked, but nonetheless appreciated, some of our readers in various parts of the world have been sending in photographs. Two categories—in particular—have been welcomed.

The first category concerns photographs which their senders believe add something to recently published *Aircraft Profiles*. The *Dassault Mirage* (No. 230) prompted such activity; perhaps understandably because it is still a current-production aircraft.

The second category is even more constructive in that readers have been sending in (and offering) photographs and colour data on *Aircraft Profiles* announced as *future* titles—such as 'Zeke 52', *Barracuda*, *MiG-21* and *Corsair II*. The authors are naturally delighted. As we said at the beginning . . . Thank you!

CHARLES W. CAIN

### ABOUT THE AUTHOR

#### No. 233 Kawanishi 4-Motor Flying-Boats

M. C. 'Mick' Richards is yet another newcomer to the growing ranks of *Aircraft Profile* authors. Hitherto, his writings have appeared in *Air Pictorial* and *Air-Britain Digest*—for this latter, the International Association of Aviation Historians, Mick Richards is the dedicated Leader of the Japanese Aviation Research Group. The "Kawanishis" represent a challenging subject for any researcher and the author has produced an impressive work.

Equally impressive are the amazingly detailed (and thus realistic) colour drawings prepared in the Windsor studio of *Profiles* by Chief Artist Mike Trim and two members of the team, Terry Hadler and Tom Brittain. Confidently, the claim can be made that these are the most accurate-yet views of "Emily" and "Mavis".

### YOUR COMMENTS

#### Bigger pictures

I have noticed that recent *Profiles* have been attempting the impossible; more text and more photos. Can we go back to bigger pictures or can we have more pages? Otherwise I think *Profiles* get better and better!

ING. Y. ZAHAVI

Tel-Aviv, Israel

EDITORIALLY SPEAKING . . . Point taken! Bigger pictures whenever possible. Are you prepared to pay more for more pages?

#### More on 'The Thud'

Reference *Profile No. 226 Thunderchief*, it stirs and reawakens many fond memories—as well as moments of terror over Hanoi.

I first flew the 'Thud' in 1963, then combat in S.E. Asia in 1965—100 missions over N. Vietnam during the height of the 1967 air offensive of Aug./Sept.—I personally have the admiration, affection and respect for the 'bird'.

ROBERT B. BENNETT, Major, USAF  
Pearl City, Hawaii

EDITORIALLY SPEAKING . . . Major Bennett sent his letter on note-paper with the heading: "Red River Valley Fighter Pilots Association". He is Chief of Flight Safety, Hq. PACAF.

#### Eye for detail

In Volume One of *Aircraft in Profile* (No. 4, page 46) your artist Richard Ward depicts Hunter F.Mk.6s in colour side views. There is a small discrepancy in the enlarged detail of the badge of No. 20 Squadron, R.A.F.



This came to light recently when I was talking to a former No. 20 pilot about Hunter operations in the Far East. The enclosed sketch (*see illustration*) shows the right colour sequence of the 'bars': top and bottom broad bands being light blue as depicted by Mr. Ward with the central white band being flanked by thin red (upper) and green (lower) bands. That the lower thin band is green and *not* red as originally illustrated has been confirmed by the R.A.F. Museum.

MIKE GETHING

Ascot, Berkshire, England

EDITORIALLY SPEAKING . . . As any artist for *Profiles* will ruefully admit: "You can't win 'em all!"

### Your next AIRCRAFT PROFILE



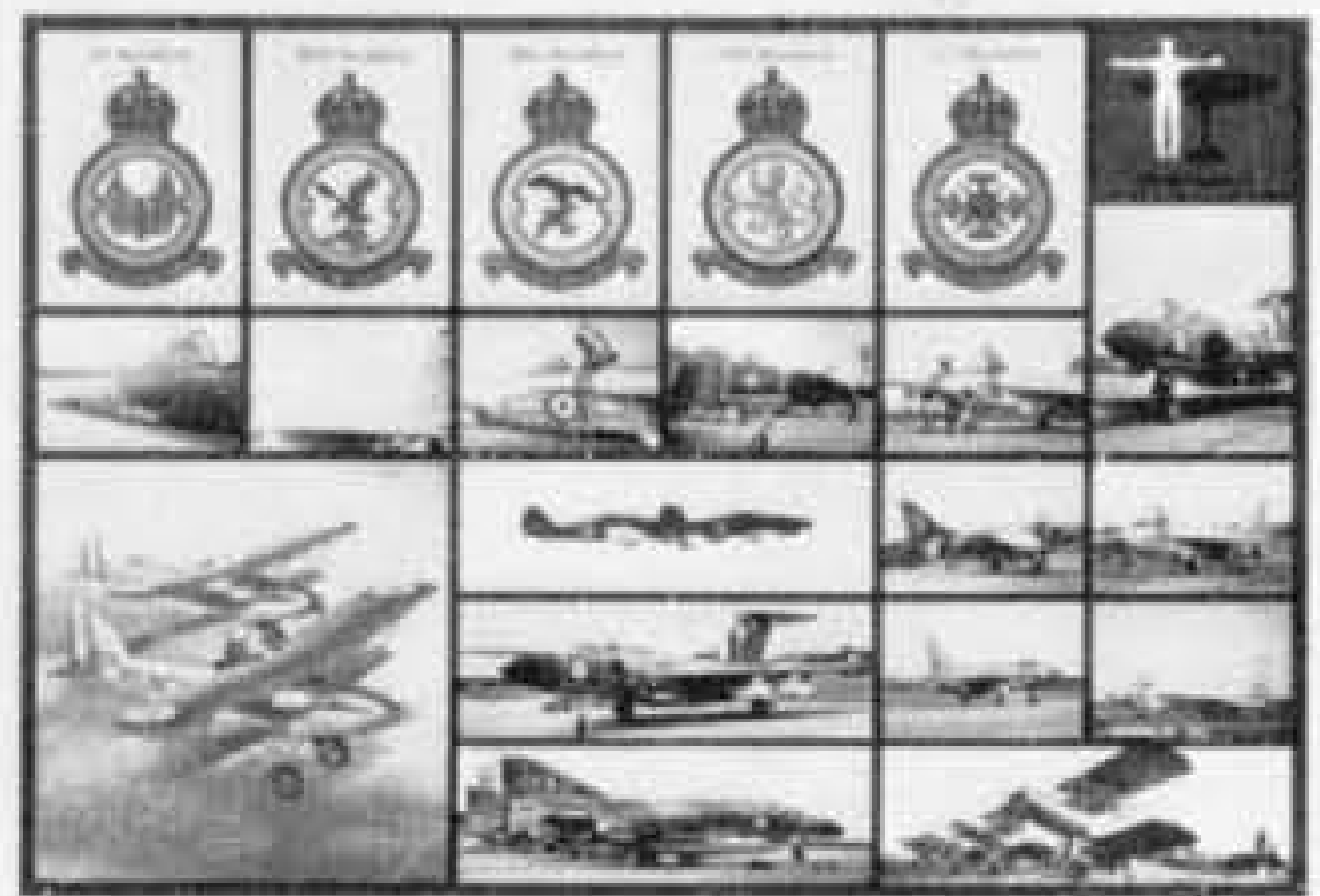
#### No. 234 Heinkel He 177 Greif

The next *Profile* is concerned with the *Luftwaffe's* problem heavy bomber, the four-motor He 177 that looked like a two-motor bomber. Alfred Price (*Profiles* No. 148: Ju 88 Night-fighters; No. 192: Boeing 707 series; and No. 207: Bf 110 Night-fighters) traces the extraordinarily complex career of the *Greif* (Griffon) in development and combat. Once again, great care has been taken to produce colour drawings which accurately reflect this complex bomber.

The publishers regret that circumstances prevented an Editorially Speaking . . . appearing in *Profile* 232.

### New Men and Machine series

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By James J. Halley

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#### Letters—brief and constructive to

Editorially speaking . . .  
Aircraft Profiles,  
Profile Publications Ltd.,  
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Windsor, Berks SL4 1EB, England.



# Aircraft Profiles

This new series of Aircraft Profiles commenced with No. 205 and continues the pattern of the complete history of the Aircraft of the World established by the early Aircraft Profiles numbered 1 to 204.

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The continuing interest in and support of the Aircraft Profiles series has encouraged the Publishers to enlarge the contents of the Profiles. From No. 216 onwards there are 28 pages in all aircraft Profiles. There are 4 pages in colour—which allows the presentation of additional side views, badges, symbols, etc.

## *New series*

- |     |  |     |  |
|-----|--|-----|--|
| 205 | Boeing B-17G Flying Fortress             | 224 | Supermarine Walrus & Seagull variants                      |
| 206 | Supermarine Spitfire Mark IX variants    | 225 | Messerschmitt Me 163 Komet                                 |
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| 209 | de Havilland Mosquito Mark IV variants   | 228 | Fieseler Fi 156 Storch variants                            |
| 210 | Mitsubishi G4M 'Betty' and Ohka Bomb     | 229 | Vickers-Armstrongs Warwick variants                        |
| 211 | Junkers Ju 87D ('Dora') variants         | 230 | Dassault Mirage variants                                   |
| 212 | Fairey Swordfish                         | 231 | Lublin R-XIII variants                                     |
| 213 | Kawanishi NIK Shiden 'George'            | 232 | Martin Maryland & Baltimore variants                       |
| 214 | Grumman TBF/Eastern TBM Avenger variants | 233 | Kawanishi 4-Motor Flying-Boats (H6K 'Mavis' & H8K 'Emily') |
| 215 | Arado Ar 234 Blitz                       | 234 | Heinkel He 177 Der Greif                                   |
| 216 | Petlyakov Pe-2 variants                  | 235 | Avro Lancaster Mk II                                       |
| 217 | Brewster Buffalo variants                | 236 | Mitsubishi A6M5 Zero-Sen ('Zeke 52')                       |
| 218 | Bristol Blenheim Mark IV                 | 237 | Bristol Fighter ('Brisfit') 1920-30s variants              |
| 219 | Heinkel He 219 Uhu                       | 238 | Mikoyan Mig-21 ('Fishbed') variants                        |
| 220 | Douglas C-47 variants (R.A.F. Dakotas)   | 239 | LTV A-7 Corsair II   |
| 221 | Supermarine Seafires (Merlins)           | 240 | Fairey Barracuda Marks I-V                                 |
| 222 | Bücker Bü 131 Jungmann variants          |     |  |
| 223 | Lockheed C-130 Hercules variants         |     |  |

*Whilst every effort will be made to maintain this programme, the Publishers reserve the right to change the sequence.*

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## Classic Car Profiles

As implied by the name, this 96 part series, at present 'resting', highlights the 'greats'. Heralded at the time of publication as a 'new and unique' series, many of the Profiles are still available. Anthony Harding, as editor, was responsible for this superb series.

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A new and ambitious series, which is fulfilling a real need for the naval enthusiast, modeller and historian. Reviewers have remarked enthusiastically on this international series. Both writers and subjects are associated with the famous and infamous warships of the world's navies. Claimed to be the first series ever to give so much detailed history and information—including superb side and plan view colour drawings of each warship featured. John Wingate, D.S.C., ex-Naval Officer, is series editor and has planned over sixty titles in the series.



Assorted Warwicks (mainly GR. Mk. Vs) lined up at Vickers' test airfield at Wisley, Surrey, awaiting delivery in early 1945. (Photo: Vickers)

## Vickers-Armstrongs Warwick variants

by Norman Barfield, D.C.Ae., C.Eng., A.F.R.Ae.S., M.I.Mech.E., M.A.I.A.A.

Greatly overshadowed by the extraordinary success of the immortal Wellington, the bigger but lesser-known Warwick that followed in production at Weybridge actually gave the Wellington its characteristic shape while these two similar-looking Vickers types were being developed in parallel during the late 1930s to meet the impending needs of war in Europe.

Unlike the Wellington, the Warwick was bedevilled by the lack of suitable higher-powered engines. Thus, when it did eventually appear in production in 1942, its rôle as a bomber was already obsolete.

Overtaken by the four-engined 'heavies', the Warwick nevertheless went on to achieve—between late 1942 and late 1947—notable success in air-sea rescue, transport and maritime general reconnaissance rôles.

### ORIGINS

Having successfully established a firm foothold in the field of air warfare as early as 1913 with its predecessor to the wartime F.B.5 (the R.F.C.'s 'Gun Bus') pusher biplane—the world's first aircraft designed to mount a gun—Vickers followed this achievement with its progression of biplane bombers and transports (Vimy/Vernon/Victoria/Valentia/Virginia) that played such a key rôle in the formative years of the Royal Air Force from World War One through the 1920s and '30s. In consequence, the company was in a strong position to meet the urgent need to develop a new generation of bombers when the threat of war in Europe was again imminent in the 1930s. The out-

standing success of the ubiquitous Wellington that resulted is well known (see *Profile No. 125*).

Paradoxically, this success was borne of failure. It was the sudden demise of British airships, following the disastrous loss of the Government-sponsored R101, that resulted in Barnes Wallis, designer of the successful privately-sponsored Vickers R100 airship, joining the Vickers aircraft team at Weybridge at the beginning of 1930 to apply his already considerable talents as a designer of light-alloy structures to this emerging need.

Deriving its monoplane form by way of the Wallis-designed experimental private-venture G.4/31 and the Wellesley long-range bomber, the B.9/32 prototype and the Wellington also incorporated the unique Wallis geodetic-type structure.

The bigger and more powerful B.1/35—eventually to become the Warwick—was intended to be complementary to the Wellington, by being matched to the emerging higher-powered engines, and both types were to be produced in parallel—the Wellington at Weybridge and its bigger brother at the Vickers shadow factory at Squires Gate, Blackpool.

In reality, the Wellington went on to be used in prolific numbers in first-line service throughout World War Two, and in every R.A.F. Command except 'Fighter', while the less fortunate Warwick only achieved a fraction of the success of the Wellington.

Many and persistent frustrations, especially in engine development, meant that the Warwick did not appear in quantity production at the main Vickers





*K4049, the B.9/32 prototype of 1936 that preceded the production Wellington bomber which was an almost total re-design—benefiting substantially from the contemporary Warwick.*  
(Photo: Barratts)

factory at Weybridge until 1942. Thus, it has been a popular misconception that the Warwick was a sequential development of the Wellington with an all-round improved mission capability. In fact, the earlier production Wellington assumed its characteristic shape by the adoption of a shortened version of the more capacious fuselage and bigger wings of the B.1/35 (as it was originally known) as these two directly-related designs progressed together from the mid-1930s.

Though failing to emulate the Wellington, the Warwick became the biggest British two-motor aircraft of World War Two and achieved notable success in pioneering new concepts of air-sea rescue and in the transport rôle that Vickers went on to exploit so successfully in both the commercial and military fields after the war.

### GESTATION

Having tendered for a twin-engine medium-bomber to Air Ministry Specification B.9/32 in October 1932, Vickers received draft requirements for a bigger partner in late 1934. By this time the Vickers Type 271 geodetic-structure B.9/32 design was already under contract and showing considerable promise. The requirements for the bigger type were eventually formal-

ised in Air Min. Spec. B.1/35 which called for a heavy-bomber of under 100 feet span (the prevailing limitation of existing R.A.F. hangars) with a speed of not less than 195 mph at 15,000 ft. altitude and a range of 1,500 miles carrying a 2,000 lb. bomb-load. Two 1,000 h.p. engines were to be used, fitted with variable-pitch propellers.

The issue of this specification elicited tenders from Airspeed, Armstrong Whitworth, Handley Page and Vickers. Only the Vickers project survived.

When Vickers submitted its tender in response to the B.1/35 specification on July 2, 1935, its design bettered these figures by a considerable margin. Based on two Bristol Hercules HEISM engines of 1,300 h.p. each, the estimated speed was 261 m.p.h. at 15,000 ft. and the corresponding 'time-to-height' was 10 minutes at an all-up weight of 23,000 lb.

### PROTOTYPE ORDERED

At this stage the B.1/35 was a completely new design with only superficial resemblance to the B.9/32, which had not yet flown. However, because it had been conceived as a heavy-bomber complement to the smaller B.9/32, a major new mock-up was not at first considered necessary. But soon after a prototype contract for the B.1/35 had been placed with Vickers—on

October 7, 1935—this decision was reversed in the light of design changes and a complete mock-up was authorized on March 14, 1936, two months before the first flight of the B.9/32 prototype (serial K4049). Vickers Type Number 284 was allocated to the project while the redesigned B.9/32—eventually to become the production Wellington Mark I—was designated Vickers Type 285.

## SHAPING THE WELLINGTON

It is important to note at this point that the production Wellington was a major redesign of the initial prototype B.1/32 and benefited considerably from the bigger B.1/35 as the detail design of the two types had proceeded simultaneously. Indeed, it was in this way that the Wellington and Warwick attained their very similar external appearance. Likewise, the close association between the two types became firmly established, remaining evident and mutually beneficial throughout their lives.

The smaller Wellington had 12 fewer frame stations in the forward fuselage, seven fewer in each inner wing, and five fewer in the nose. The deeper fuselage of the B.1/35 better suited the larger bomb load and associated equipment specified for the production Wellington and the more functional shape of the B.1/35 thus became the basis for both designs. It followed naturally that there was a high proportion (60 per cent.) of parts common to the two aircraft. This, together with the inherent simplicity of the multi-element geodetic-type structure, proved to be a great asset in production.

Other evident distinguishing points of the B.1/35 (compared to the Wellington) included a bigger and reshaped fin, rearward-projecting engine nacelles with much larger scoop intakes, and the pilot's compartment well ahead of the propellers because of the longer nose. Less visibly evident were the 50 per cent. in-

crease in bomb-load, better performance, greater range and improved crew accommodation.

With the relaxation of the Geneva Disarmament Conference restrictions, the weight of the B.9/32 grew steadily and quickly approached that of the datum B.1/35 which also increased accordingly and, by July 1936, its all-up weight had risen to 30,370 lb.

In January 1937, the new Rolls-Royce Vulture engine—a 24-cylinder 2,000 brake horsepower engine of X-shape (effectively two R-R Kestrels with a common crankcase) promised considerable extra potential for the B.1/35. Consequently, alternative mountings for the new engine were requested by the Air Ministry.

While the first prototype B.1/35 proceeded with the Vulture, a second prototype (L9704) was ordered on July 2, 1937 as an 'insurance' against possible failure of the Vulture programme.

In November 1937, a requirement was issued for consideration of fitment of another promising contemporary higher-powered engine—the Napier Sabre, also a 24-cylinder engine, but of H-configuration.

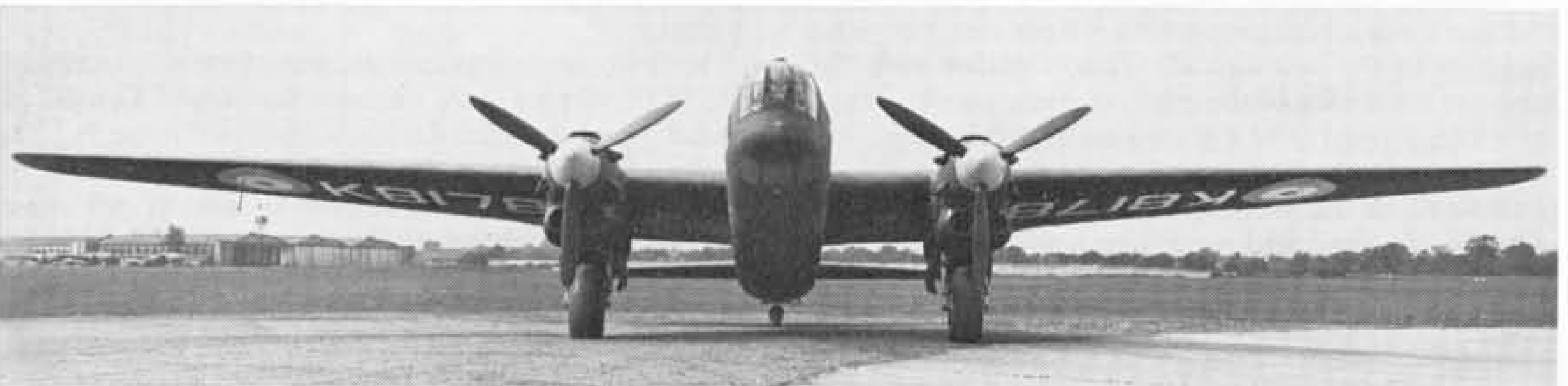
Air Ministry supplementary Specification P.13/36, which had been issued to cover aircraft powered by the Vulture and Sabre engines, included the B.1/35. The implications of this specification resulted in an amendment of the Vickers B.1/35 contract for the first prototype (Vickers Type 284) to incorporate Vultures, and the second prototype (Vickers Type 400) to have Sabres but also with alternative mountings for the Vulture.

Yet a further complication came about on December 16, 1937, when a third engine—the Bristol Centaurus radial—was specified for consideration in the B.1/35. However, this move did result in the agreement of common bulkhead attachment points by all three engine manufacturers to facilitate powerplant interchangeability and the Vulture standard was taken as the datum. Vickers Type 401 was allocated to its Centaurus-powered B.1/35 design.

*Typical Vickers-Armstrongs Wellington bomber which was effectively a cut-down Warwick airframe.*

(Photo: Vickers Limited)





*First prototype Vickers B.1/35 (K8178), fitted with Rolls-Royce Vulture engines, and seen at Brooklands in August 1939 at the time of its first flight. (Photos: Air Ministry)*

By early 1938, the performance and mission capability of Vickers B.1/35 design was far in advance of its original tender of July 1935, although overall dimensions were little changed. All-up weight was even greater, maximum speed was 332 m.p.h. and Rolls-Royce Vulture S engines driving 14 ft. 6 in.-diameter propellers were to be fitted to the first prototype (K8178).

However, although promising a significantly better all-round capability, the Vickers B.1/35 was now in the same class as the newer Avro Manchester, that had emerged from the P.13/36 specification, and its prospects were still far from bright. The situation was further aggravated by the Air Ministry decision to channel the main flow of Vulture engines into the Manchester programme.

### **FRUSTRATING DEVELOPMENT PROBLEMS**

Development of the Napier Sabre engine, intended for the second prototype L9704, could not match the estimates for K8178 and, in December 1938, the Air

Ministry substituted the Centaurus for L9704, while the Sabre remained as an alternative for K8178. Alternative propellers were also specified—Rotol for the Vulture and de Havilland for the Centaurus and Sabre. Predicted delivery dates for these engines were: Vultures by the end of January 1939, and the Centaurus and Sabre by the end of March 1939.

In addition to the continuing engine development problems, the B.1/35 also suffered problems in gun turret design and Frazer-Nash turrets eventually replaced the initial Vickers-designed turrets. The two prototypes were to be fitted with the FN5 type in the nose, the FN9 amidships, and the FN10 in the tail—each incorporating two 0.303-inch Browning machine-guns.

To make matters worse, official doubts were raised in December 1938 about the geodetic construction of the B.1/35, and work on jigs and tools was temporarily halted. However, a subsequent high-level resubmission of programme data in relation to the P.13/36 specification requirements, including the three different engine installations, led to work being resumed seven months later at the end of June 1939. By this time the first





*Second prototype Vickers B.1/35 (L9704), powered by Bristol Centaurus CEISM engines (Vickers Type 401), and seen at Brooklands in March 1940 just prior to its first flight (without armament). (Photos: Air Ministry)*

Vulture engines had been delivered, together with the Rotol constant-speed propellers.

When weighed on July 6, 1939, K8178 had a tare weight of 26,000 lb. which became 27,032 lb. with the addition of propellers, armour-plating and other sundries. The further addition of the operational load—7,500 lb. of bombs, 700 Imperial gallons of fuel, 40 gallons of oil, a military load of 1,040 lb. and a crew of five—resulted in a calculated service all-up weight of 42,182 lb. This was almost double the figure in Vickers original tender of four years earlier.

With a design certificate for flight trials at a weight of 30,000 lb., K8178 was flown for the first time at Brooklands (Surrey) on August 13, 1939. This was three weeks before the outbreak of World War Two and the pilot was 'Mutt' Summers, for many years Vickers chief test pilot. He was accompanied by Trevor Westbrook, production superintendent, acting as observer. Airborne only a few minutes because of a defect in the carburettor linkage, the aircraft resumed flying again six days later with a Vickers-designed linkage which gave no further trouble.

So ended over four years of frustrating effort that had escaped the smaller Bristol Pegasus-powered Wellington, which had already been flying for three years and production-established at Weybridge for more than 18 months.

However, initial flight tests with K8178 revealed considerable shortcomings. It was heavy, slow, underpowered and unable to maintain height on one engine.

At this time the second prototype, L9704, was at an advanced stage of completion. The first pair of Centaurus CEISM engines were delivered in December 1939, and the de Havilland constant-speed propellers a month later.

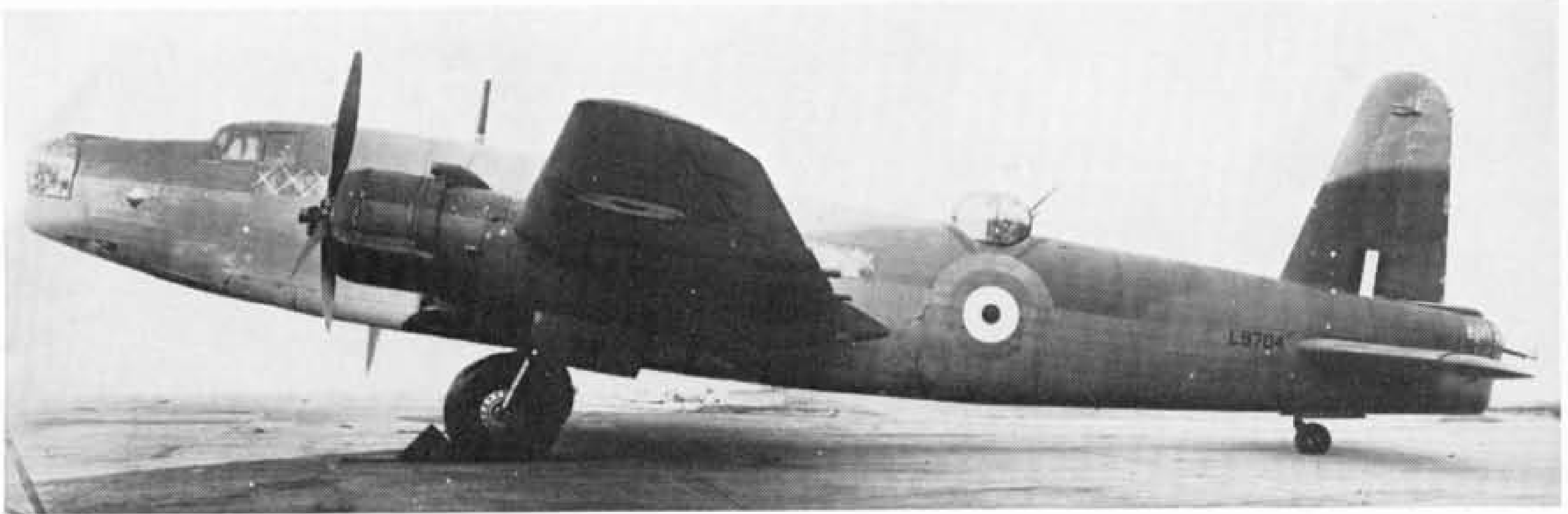
L9704 was first flown by Summers from Brooklands

on April 5, 1940, at a gross weight of 29,075 lb. Both prototypes were flown the same afternoon, thus enabling a direct comparison to be made. While the Vulture-powered K8178 now incorporated a number of modifications to improve handling characteristics—notably a revised elevator shape—the Centaurus-powered L9704 exhibited a definite performance improvement, and at certain heights was reputed to be faster than the Hurricane.

### CRITICAL ENGINE SITUATION

The urgent need of the Sabre engine for fighters—notably the Hawker Typhoon and Tempest—resulted in the cancellation of the plan to fit this powerplant to K8178. Delays in production of the Centaurus led to a proposition in October 1939 to fit four Rolls-Royce Merlin XX or Bristol Hercules HE7SM engines but this, too, was abandoned because of the resulting serious deficiency in range and bomb-load. Although the Vulture did reach initial production and service in the Avro Manchester, the inadequate power and severe teething troubles of this engine (notably fatigue failure of connecting rod bolts) meant that it had to be abandoned by Rolls-Royce in 1940 to enable them to give absolute priority to the Merlin.

So difficult and confused was the engine situation in relation to production plans for the Vickers B.1/35 that in July 1940 the suggestion of fitting American Pratt & Whitney or Wright engines was made. The use of the P&W Double Wasp engine showed estimated performance levels similar to those of the contemporary Wellington III with Hercules III engines, but with a significantly bigger bomb-load. Additionally, the P&W engines were readily available from redundant French Government contracts made prior to the



*Starboard and port views of L9704 (Centaurus engines) seen at Filton, before and after repainting and removal of sombre black undersides. Oversize vertical stripes on fin are unusual.* (Photos: Bristol Aeroplane Company)



*Centaurus-powered L9704 seen at Vickers shadow factory at Squires Gate, Blackpool in February 1941.* (Photo: Vickers)

*Double Wasp-powered L9704 at Vickers factory, Weybridge.*

(Photo: Air-Britain Photo Library ref. A1899)



collapse of France. This led to the decision, later that month, to allocate two Double Wasps for L9704.

Flight handling trials at Boscombe Down with the Centaurus-powered L9704 revealed various control deficiencies and new and lighter elevators and rudder were proposed. In October 1940, the fin and rudder of the Wellington Mk. I was fitted in an attempt to improve yaw stability. Meanwhile, K8178 had been undergoing engine development flying with Rolls-Royce at Hucknall (Nottinghamshire), being fitted with two production Vulture II engines. This programme was terminated in January 1941 and K8178 was dismantled.

### ORDERED INTO PRODUCTION

Despite the prevailing atmosphere of uncertainty and compromise, the B.1/35 still had considerable potential and this was at last rewarded by a Ministry contract on

January 3, 1941, for 250 bomber airframes with deliveries to begin in November that year. In turn, this led to the need for a name to supplant the now six-year old Air Ministry Spec. 'B.1/35' designation. In accordance with the Air Ministry practice of naming bombers after towns, and Vickers own practice of using the initial letter 'W' for aircraft with Wallis-designed geodetic structures, the name 'Warwick' was chosen.

This initial production contract was split into 150 designated Warwick B.Mk. I and powered by Double Wasps (Vickers Type 422) and 100 Warwick B.Mk. II with the Centaurus (Vickers Type 413).

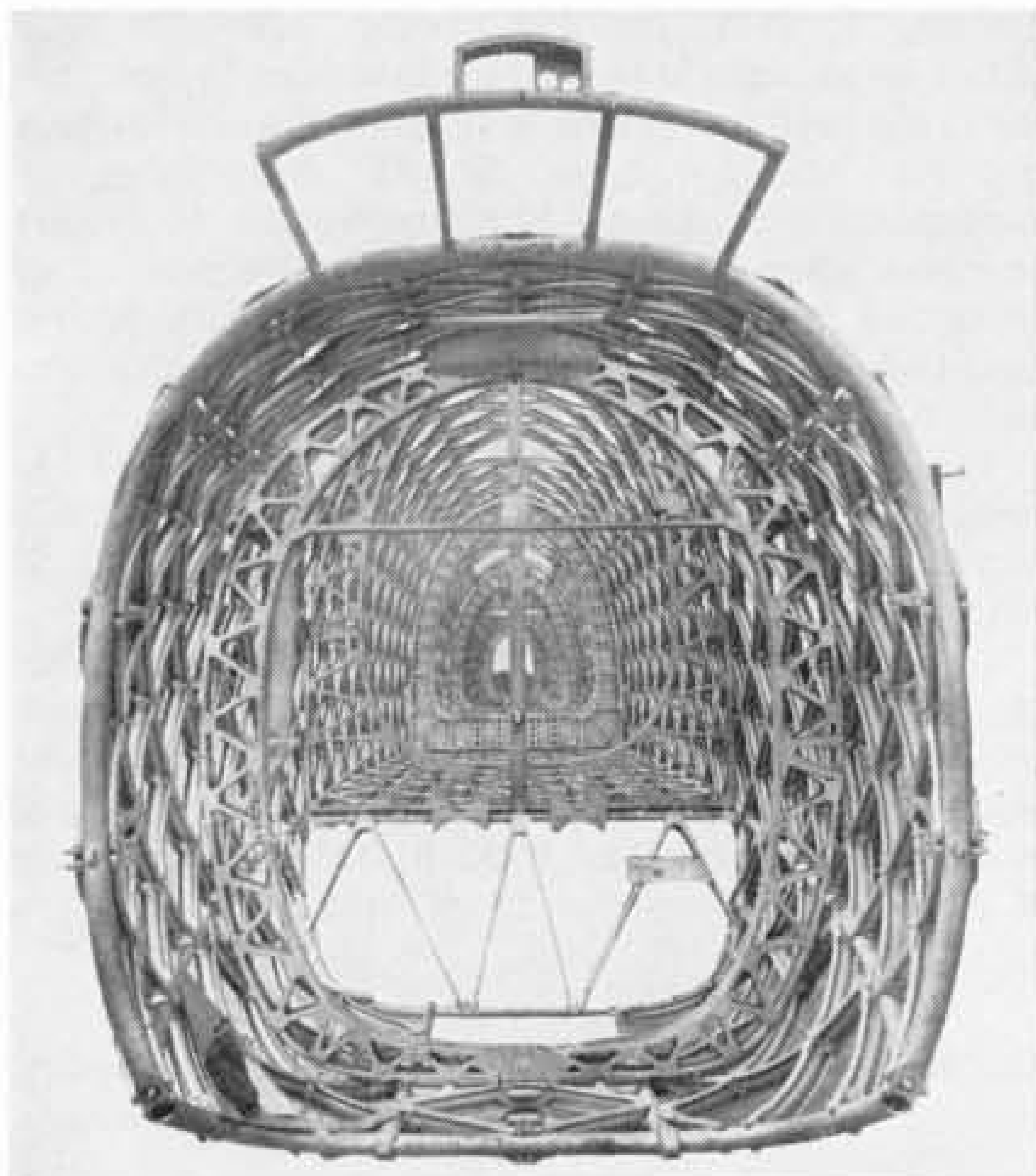
Despite the relative security of a substantial initial production order, the Centaurus-powered Warwick prototype L9704 still had troubles in matching engine gear ratio and propellers. Thus, the ultimate choice of powerplant became the 1,850 h.p. P&W Double Wasp R-2800-S1A4-G with a 15 ft. diameter Hamilton

*First production Warwick B.Mk. I (BV214) at Brooklands in May 1942. P&W Double Wasp engines.*

(Photos: Air Ministry)







*End view (looking aft) of the Warwick fuselage structure.*

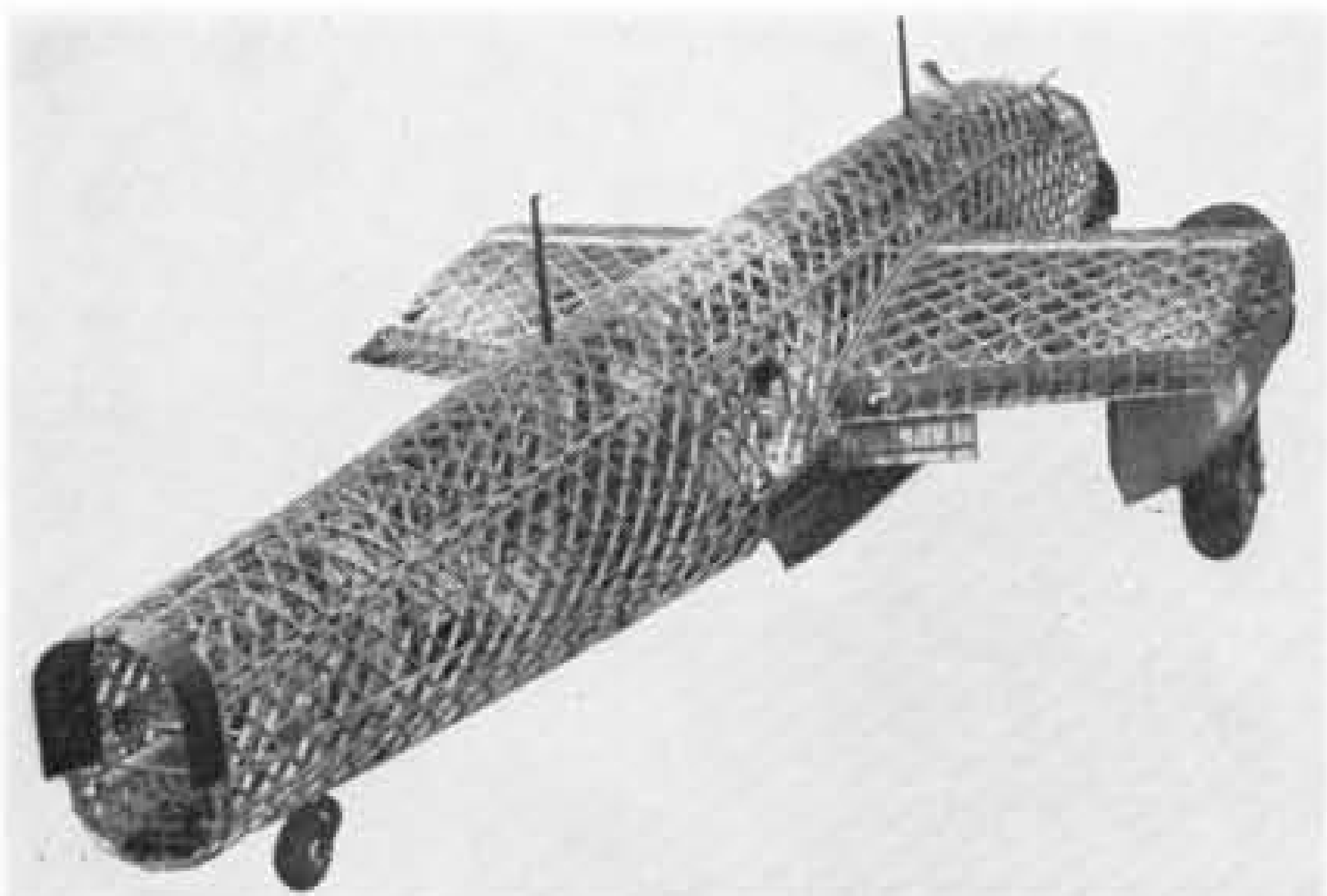
Standard Hydromatic three-blade fully-feathering propeller and a 0.4 engine gear ratio.

Of necessity, the Double Wasps were despatched from the U.S.A. by sea which resulted in yet further delay. Although the initial Double Wasp installation for L9704 (Vickers Type 427) was planned for February 1941, this delay meant that the job was not completed until five months later.

Meanwhile, L9704 continued flight investigation of an alternative tail unit. This consisted of combining a new balance tab and modified trim tab with the thinner-section tailplane and elevators transferred from K8178. This combination proved to be a marked improvement in handling compared with previous thicker sections.

With the Double Wasps fitted at Weybridge in July 1941, L9704 began trials at the Aeroplane and Armament Experimental Establishment (A.&A.E.E.) at Boscombe Down (Wiltshire). After a brief return to Weybridge for fitment of production standard engines

*Primary geodetic structural features of the Warwick. Note how the engine nacelle is completely external to the wing structure.*  
(Photo: Air Ministry)



### Key to colour illustrations

- 1 K8178, first prototype Vickers-Armstrongs Type 284 Warwick, powered by two Rolls-Royce Vulture liquid-cooled X-type in-line engines. Period: August 1939.
- 2 L9704, second prototype Warwick (Vickers Type 401), powered by Bristol Centaurus air-cooled two-row radial engines. Period: 1940.
- 3 BV214, the first series production Warwick B.Mk.I (Vickers Type 422), fitted with Pratt & Whitney Double Wasp two-row radials. Period: Mid-1942.
- 4 G-AGEX, the first commercial transport Warwick C.Mk.I (Vickers Type 456), also powered by Double Wasps. From 1942 onwards, 14 ex-B.Mk.Is (BV243 to BV256) were allocated to BOAC with civil registrations respectively G-AGEX to 'GFK.

and propellers, further trials revealed a starting difficulty which was cured by fitting a revised booster coil.

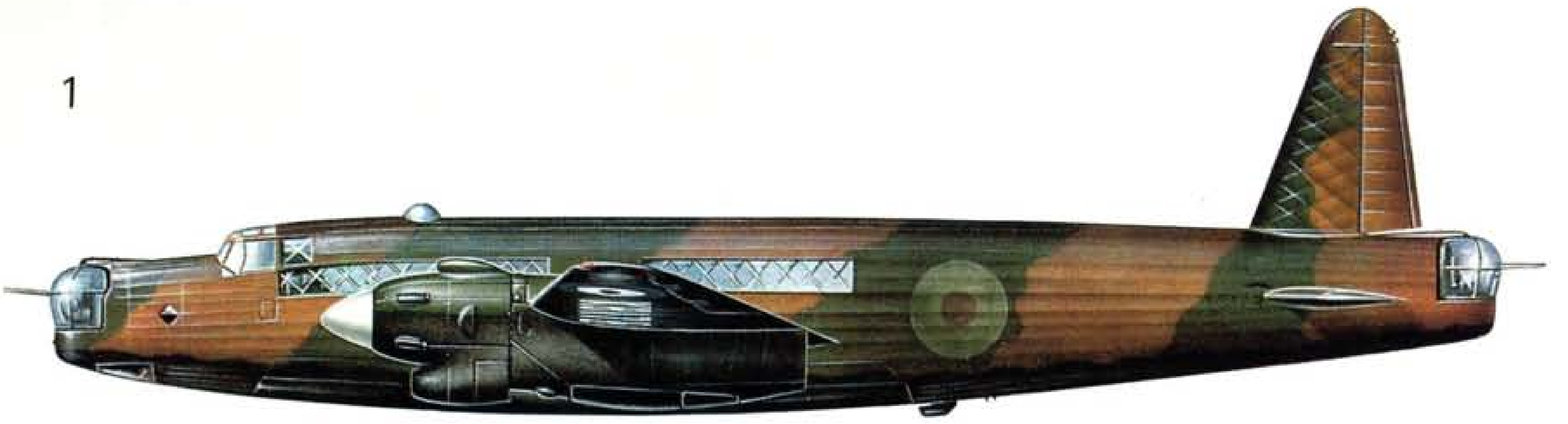
The Warwick continued to be subject to an extraordinary range of investigations of alternative operational rôles in an endeavour to keep pace with the swiftly changing fortunes and policies of war. However, a comparatively orderly development progression followed now that a definitive production standard had at last been achieved. The main Warwick production variants are now discussed in numerical order.

### WARWICK I—BOMBER, AIR-SEA RESCUE, COMMERCIAL TRANSPORT

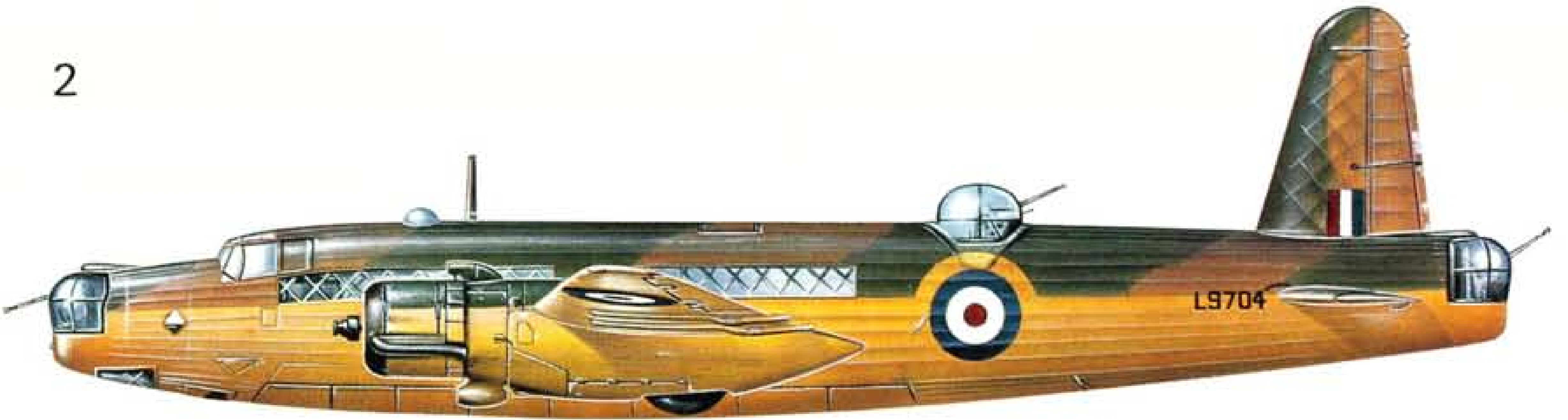
Because of the sustained shortage of suitable engines and continually changing policy, only 16 of the order for 150 Warwick B.Mk.Is were actually built. In fact, even when the first production aircraft was complete at Weybridge in April 1942—over a year after the order had been placed—the capability for the Warwick as a bomber was already well behind Air Staff requirements. This was because of the rapid progress of newer and faster four-engined designs—which could carry heavier bomb loads over greater distances—and the decision was made to re-equip R.A.F. Bomber Command exclusively with them. As the Wellington was also progressively coming out of Bomber Command, the two Vickers two-motor types were re-allocated to a wide range of other operational duties—air-sea rescue, troop and cargo transport, long-range anti-submarine patrol, general reconnaissance, operational crew-training and so on.

Initially flown from the Brooklands factory on May 1, 1942, the first production Warwick (BV214) was transferred to Boscombe Down for Service acceptance

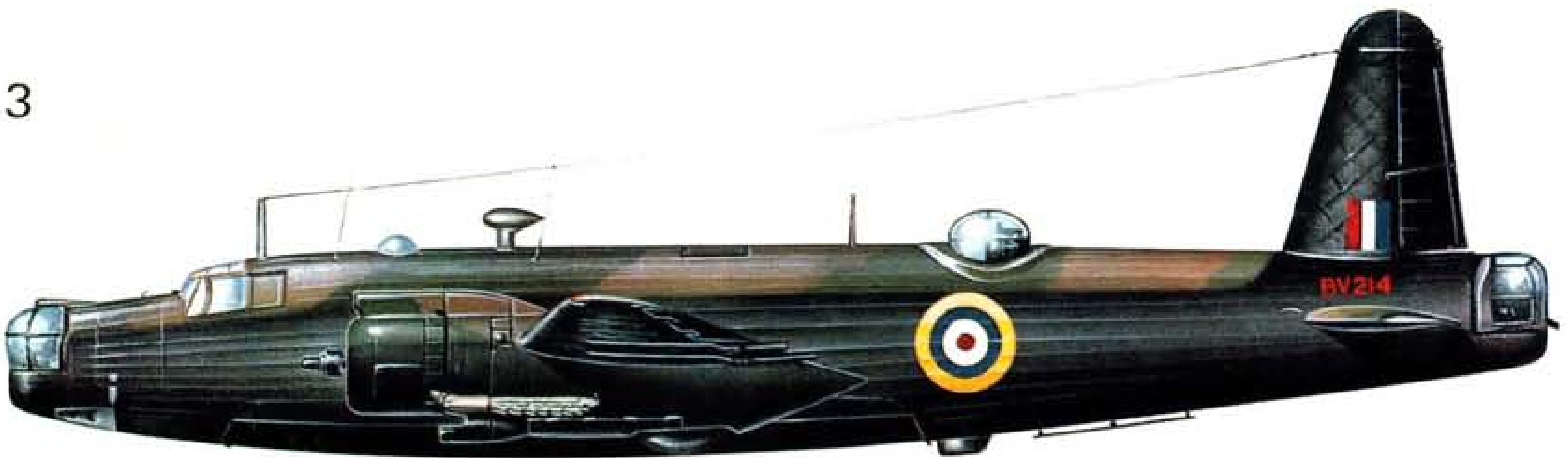
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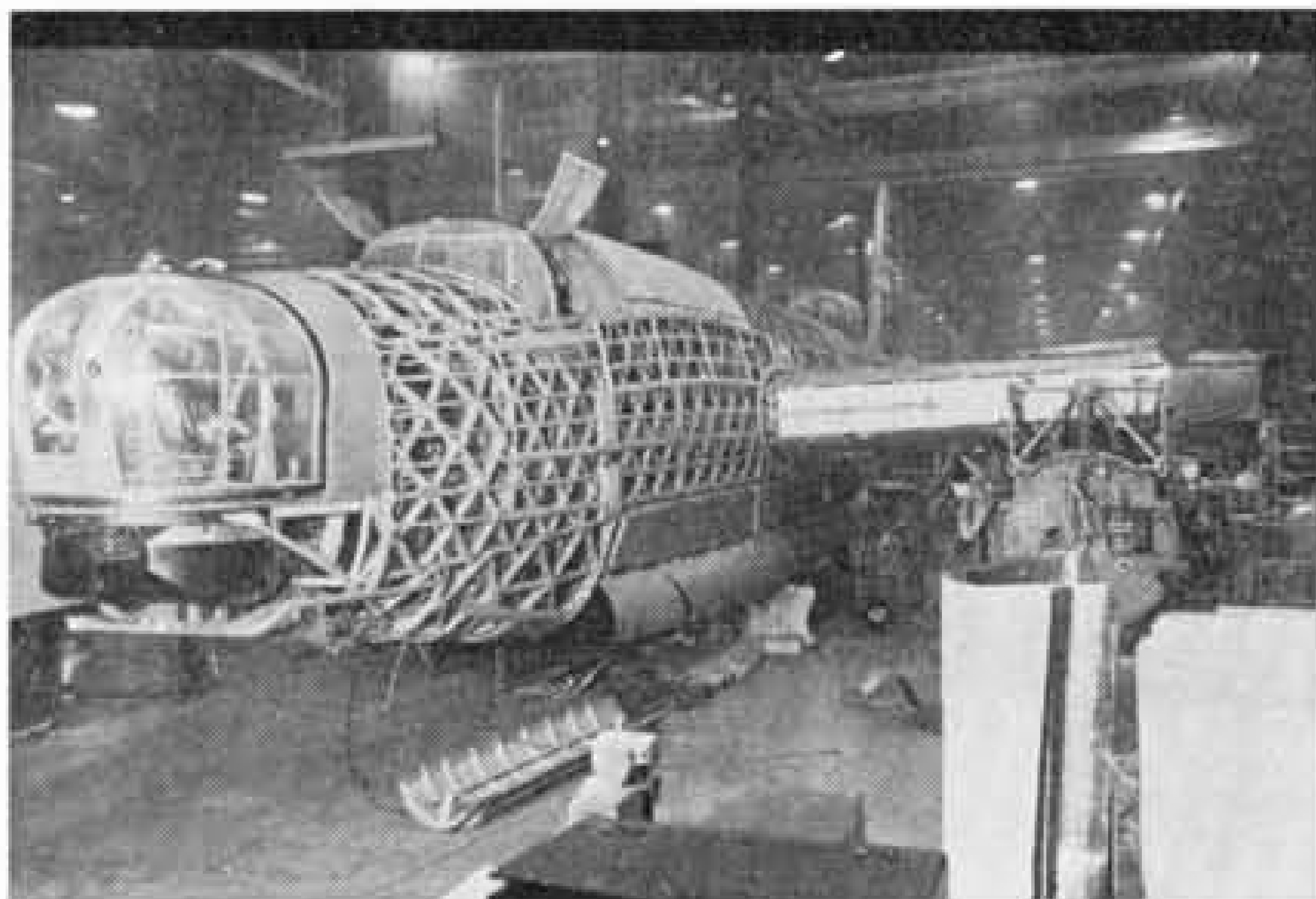


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*A Warwick B.Mk. I in final assembly at Weybridge.  
(Photo: Vickers)*

trials and was flown at an all-up weight of 36,900 lb. However, its flying life was brief. Loose fabric panel attachments on the wings resulted in the loss of the aircraft on August 28, 1942.

The second production Warwick (BV215), continued the flight trials which concentrated on investigating single-engine performance and the persistent directional control problems; control surface design (and the matching of different powerplant configurations) was still a very imprecise science. Horn-balanced rudders and spring tabs were tried but BV215's life was also a short one. It was burnt out at the Royal Aircraft Establishment, Farnborough (Hampshire), on February 18, 1943, from a fire beginning in the starboard engine during restarting on the ground between test flights.

In mid-1943, BV216 was converted to become the



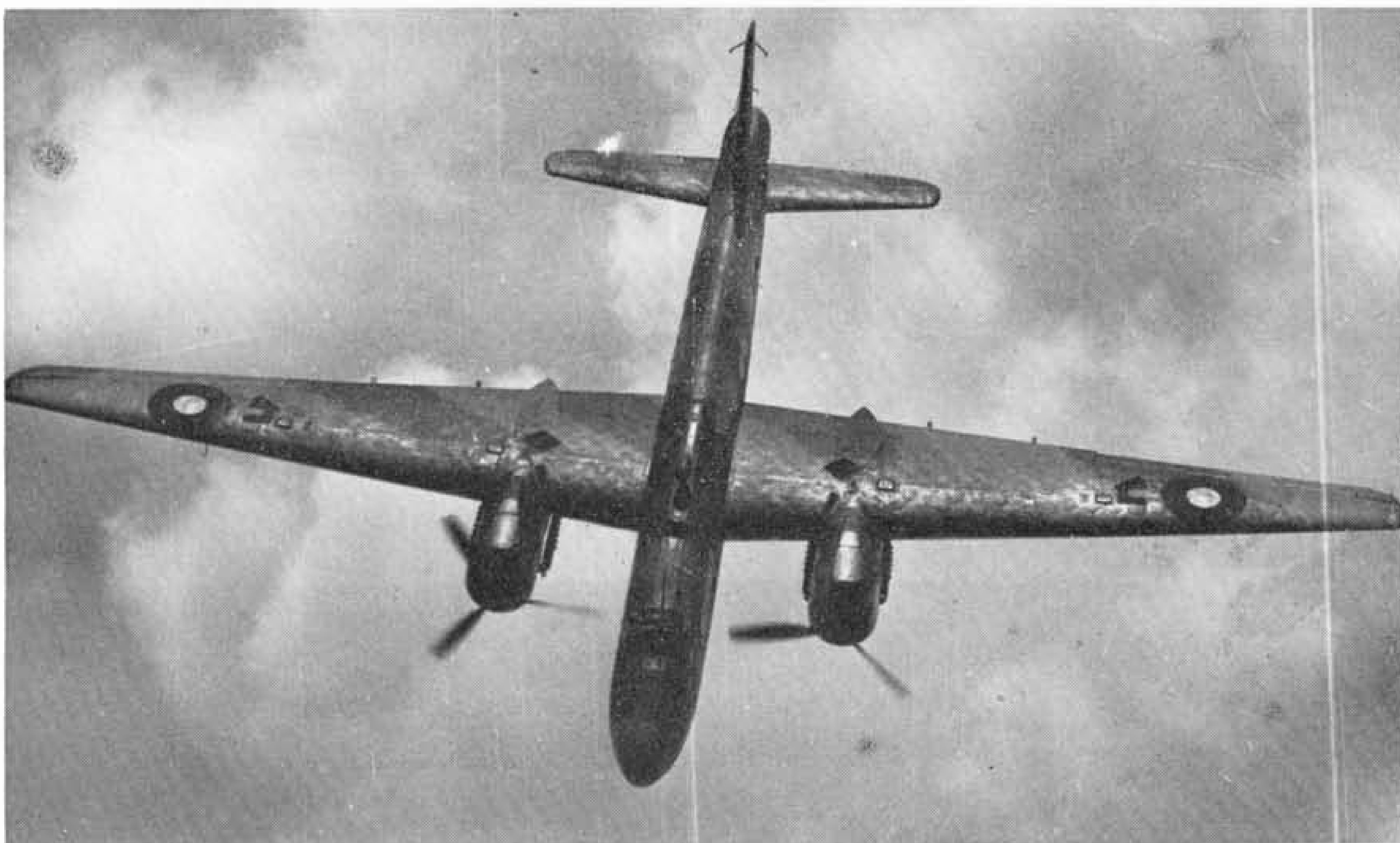
*Fourth of the 14 Warwick C.Mk. Is of BOAC (G-AGFA, ex-BV246), at Brooklands in February 1943; showing to effect the passenger windows, exhaust-stack flame dampers and faired-over gun turret positions that characterized this conversion from the B.Mk. I bomber airframe.*

Warwick B.Mk. II prototype by fitting Centaurus IV engines (Vickers Type 413).

Stability and control tests continued with the third production B.Mk. I, (BV217). A new bulged rudder with increased trim movement and a new elevator system and tailplane setting were incorporated. Together these changes eventually resulted in acceptable handling during single-engine flying on either engine. This B.Mk. I continued as a test vehicle for another two years, ultimately being used in 1944 to evaluate rudder characteristics for the Vickers VC1 (more familiarly the Viking), Britain's first post-war airliner.

The Warwick B.Mk. I saw little service as a bomber and of the 16 built, several were used to investigate a wide range of technical features. Typically, BV224 was used to evaluate navigational equipment at Boscombe Down in 1943 and engine cooling and fuel con-

*This overhead view of the Warwick C.Mk. I clearly reveals the geodetic-member pattern of the upper surface of the fabric-covered wing.  
(Photo: Imperial War Museum)*







*G-AGFK, the last of 14 Warwick C.Mk. Is converted for BOAC. This aircraft and G-AGFJ had cabin windows different from the remainder of the fleet.* (Photo: Vickers)

sumption trials the following year; BV224 and BV295 were used to check carbon monoxide contamination at the various crew positions; BV226 was converted for the investigation of suitability for the air-sea rescue and transport rôles; and BV228 was used for the trial installation of an airborne lifeboat, as discussed later.

The Warwick I had a maximum speed of 224 m.p.h. and a cruising speed of 210 m.p.h. Maximum loaded weight was 45,000 lb. Armament comprised twin 0.303-in. machine-guns in the nose and dorsal turrets and four 0.303-in. guns in the tail turret.

Fortuitously, the frustrated development of the Warwick for the bomber rôle was compensated by an emerging view that its spacious fuselage and long range could lead to worthwhile utility in the transport rôle. In January 1943, an Air Staff decision was taken that the transport and air-sea rescue rôles would henceforth predominate for the Warwick (by which

time 57 B.Mk. I airframes had been made before production could be changed).

The first of these was to crystallize in 1942 with an order for 14 Warwick transports for British Overseas Airways Corporation—designated Warwick C.Mk. I (Vickers Type 456). The initially prescribed operational requirements were the carriage of mail, freight and passengers (in that order of priority) across Africa between Bathurst and Cairo, to complement BOAC's flying-boat operation between England and Bathurst.

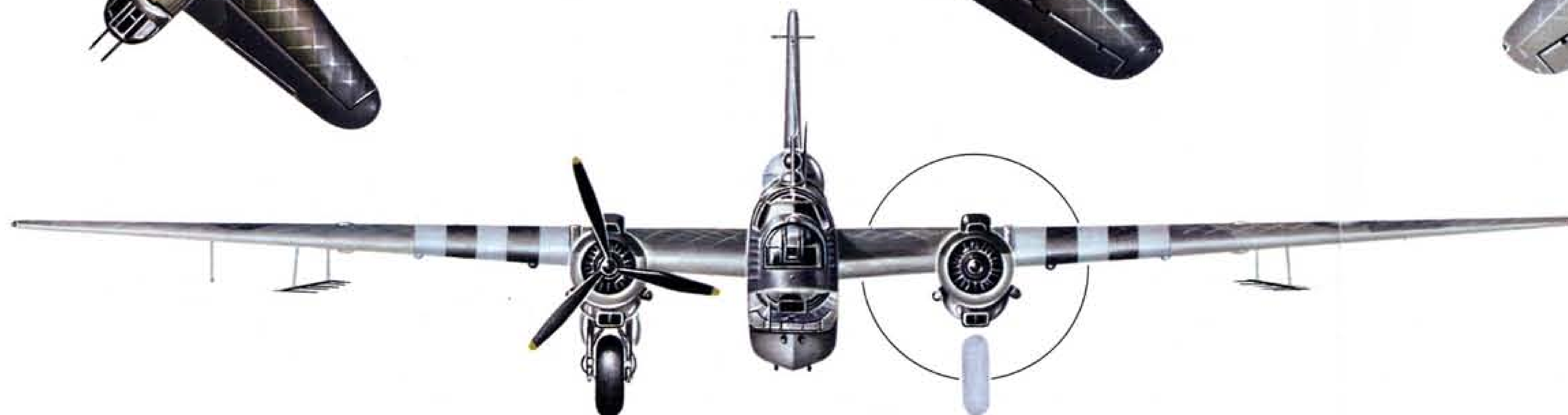
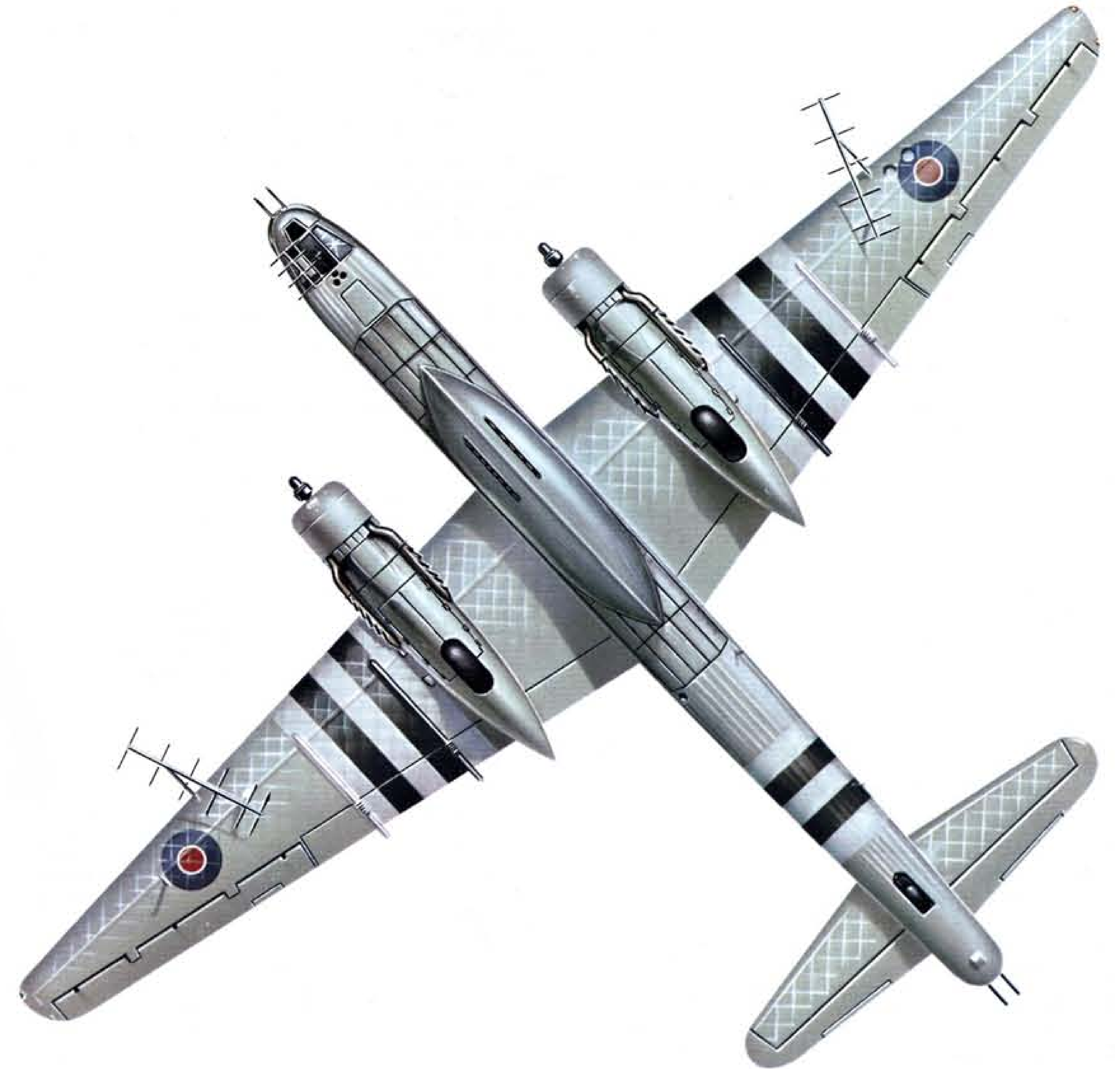
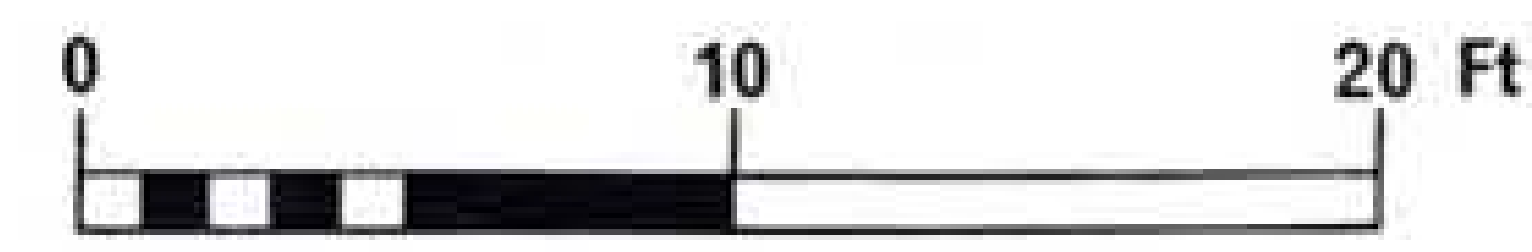
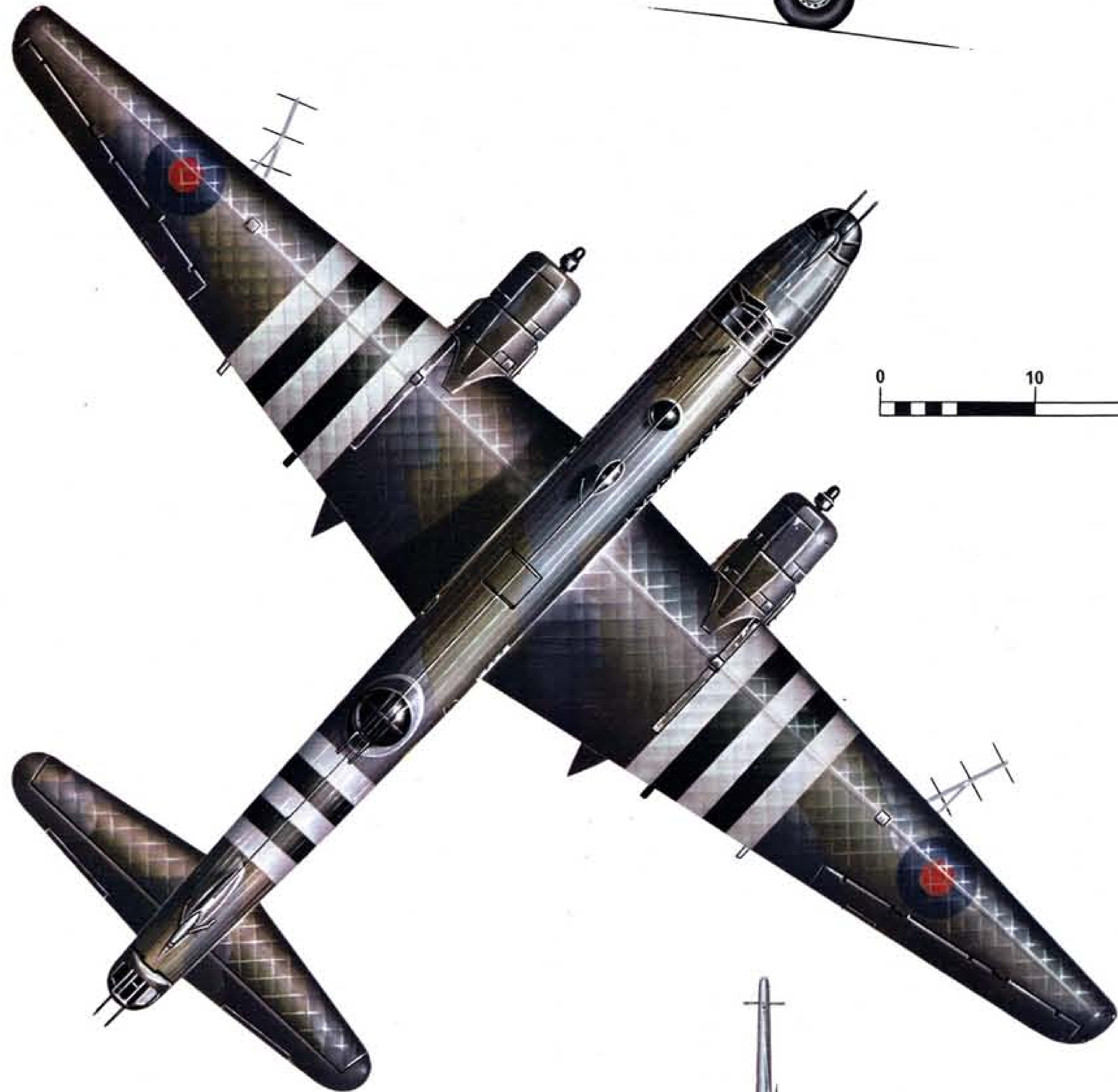
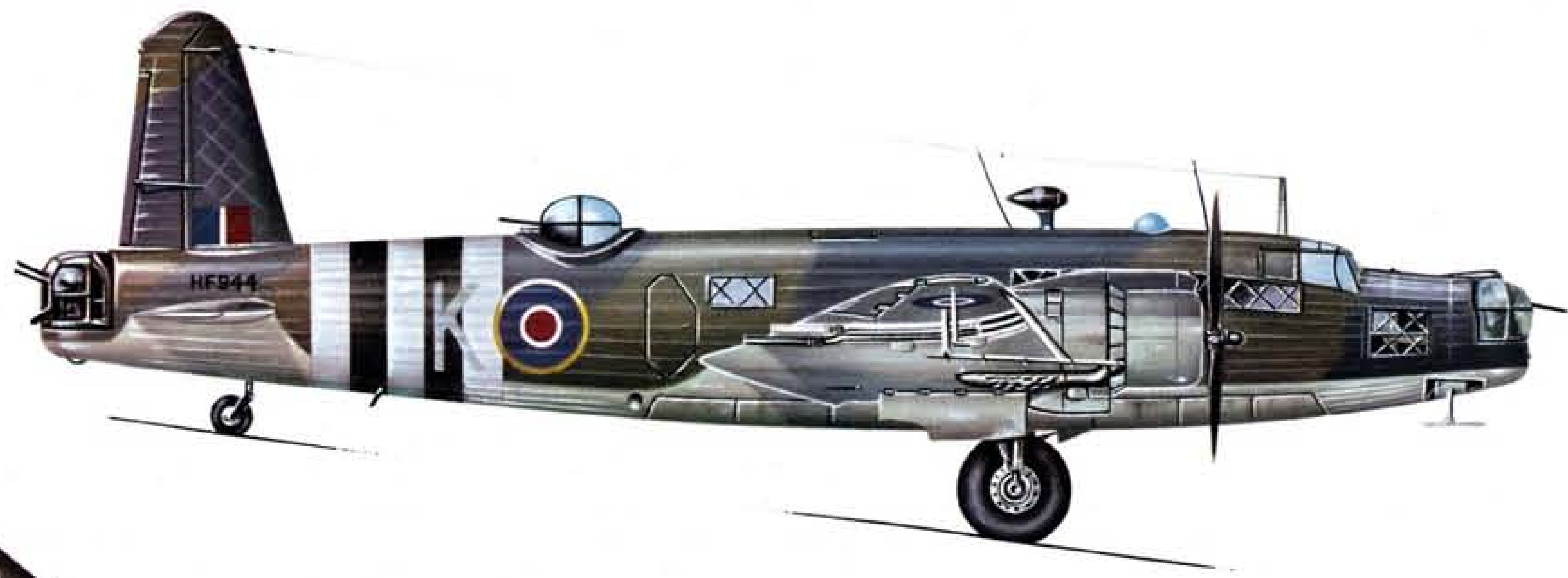
These aircraft were, in fact, major conversions of surplus B.Mk. I airframes. Nevertheless, the big task of removing all military accoutrements, fairing over the gun turrets, and the fitting of cabin windows, a freight floor, long-range fuel tanks, and exhaust stack flame-dampers for night flying, was quickly completed and the first flight made on February 5. The 14 Warwicks (BV243 to BV256 inclusive) were used to

*Cabin interior of the Warwick C.Mk. I converted for BOAC in 1943 and showing how well the spacious fuselage of the Warwick matched the transport rôle. Also noteworthy are the numerous detail features such as sidewall and ceiling trim panels with a window and coathanger at each seat position, overhead netting for hand baggage, roof lights, fire extinguishers and emergency exit.* (Photo: Vickers)

*BV285, an early Warwick ASR 'Stage A'—converted from a surplus B.Mk. I airframe—in maritime paint scheme.* (Photo: Air-Britain Photo Library, ref. 1900)

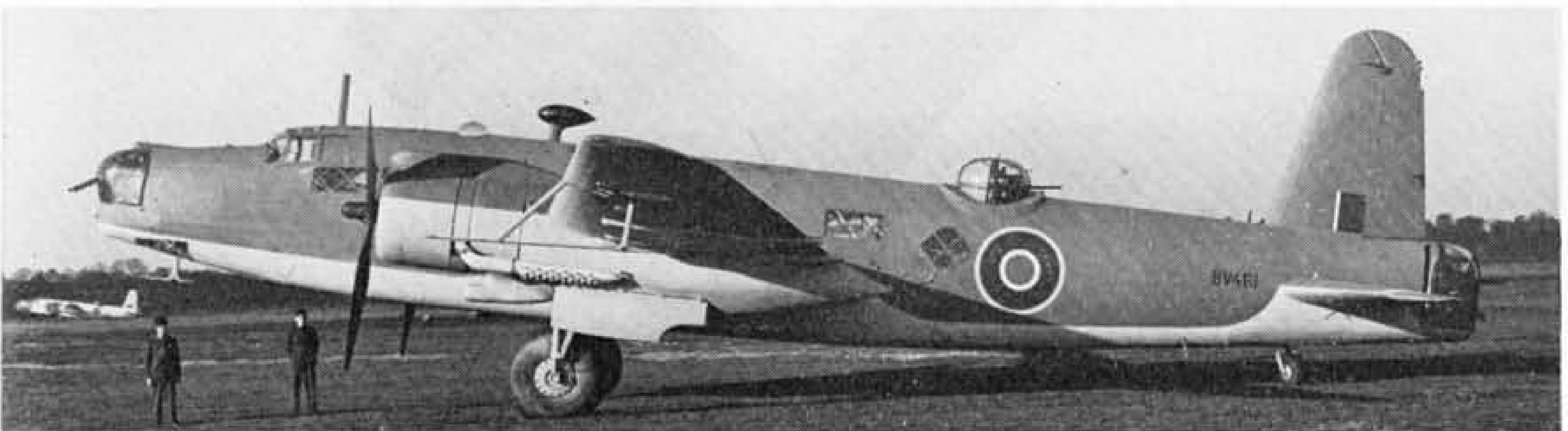






HF944 is a Vickers-Armstrong Type 462 Warwick ASR. Mk.1 (Pratt & Whitney Double Wasp radials) in Royal Air Force Coastal Command colours. This ASR. Mk.1 went to No. 45 Maintenance Unit in January 1944 and, later, served with No. 282 Squadron, R.A.F., carrying a Mk.1A Lifeboat. In January 1946, HG944 went to R.A.F. Shawbury and was burnt there in July of the same year.





*BV461, a Warwick ASR. Mk. I 'Stage C' (Tropical) seen at Brooklands just prior to delivery to Kinloss on November 9, 1943. (Photos: Vickers)*

fulfil the BOAC requirement and were allocated the civil registrations G-AGEX to G-AGFK. Operational payload was 9,600 lb.

BOAC deployed the Warwick C.Mk. I later that year on a mail service to British forces in North Africa and the Mediterranean area. Early in 1944, these aircraft reverted to the R.A.F. (with their original military serials), initially with No. 167 Squadron at Holmesley South and ultimately to No. 525 Squadron at Lyneham, when the Warwick C.Mk. III (described later), became available in quantity to R.A.F. Transport Command for this and many other transport duties.

To meet the air-sea rescue (ASR) requirement, Vickers evolved its Type 462, the primary job being the rescue of the large number of Allied bomber crews 'ditched' in the North Sea when returning from air raids on Germany.

In the early part of the war, Avro Ansons and Westland Lysanders had been used for ASR operations, the responsibility for which was transferred from R.A.F. Fighter to Coastal Command in August 1941.

These comparatively slow aircraft had limited operational range to only 40 miles from the English coast. For a short spell the American Lockheed Hudson III was introduced to replace the Anson but this type was transferred to other more urgent operational duties with the advent of the Warwick.

The Warwick ASR included the installation of Lindholme inflatable dinghy equipment and the external carriage of an airborne lifeboat. The operational mission called for an 1,800-mile range with the lifeboat fitted and the ability to drop the boat or two sets of the Lindholme equipment (10 containers) at flying speeds of between 100 and 130 m.p.h.

Parallel orders were placed in May 1943 for 100 ASR and 100 transport Warwicks which superseded previous orders for the bomber version. However, because of the lead time required to develop the necessary modifications and a suitable lifeboat, a batch of 40 existing airframes was converted to carry the Lindholme gear only and designated Warwick Bomber/ASR. The first to be so converted (BV297) was delivered to Docking on July 8, 1943.



The airborne lifeboat for the Warwick ASR was designed and built by the famous yacht designer Uffa Fox and attached to the standard bomb-bay lugs.

A 1/13th scale model of the so-called 'Mk. I Lifeboat' was used for initial wind tunnel dropping tests at R.A.E. Farnborough, and the full-scale lifeboat (complete with engines, ASR equipment and cluster of six 32-ft. parachutes) weighed around 1,700 lb. Later, an improved Mk. IA lifeboat of about the same weight was used.

The first 10 production Warwick ASRs were designated 'ASR. Stage A'. Although lifeboat dropping trials for the air-sea rescue rôle had been made earlier in 1943—using a Lockheed Hudson III specially converted by Cunliffe Owen Aircraft and tested off Cowes, I.O.W.—extensive full-scale trials were deemed necessary with the Warwick. BV298 was the first Warwick to be equipped to carry both the lifeboat and the Lindholme gear. BV298 and BV242 shared the intensive development flying at A.&A.E.E. Boscombe Down, which totalled over 180 hours. This whole programme was satisfactorily completed by mid-1943 and No. 280 Squadron, R.A.F. at Langham (Norfolk) was the first to receive Warwick ASRs when three aircraft (BV282, BV284 and BV286) were delivered there in August 1943.

The Warwick 'ASR. Stage B' then followed and had additional provision for ASV (Air-to-Surface Vessel) radar and 20 such aircraft were built.

The definitive production Warwick ASR was the 'ASR. Stage C' which was later designated 'Warwick ASR. Mk. I'. This version incorporated extra fuel tankage. An improved 'Mk. II Lifeboat' was also developed. This 30-ft. long, single-engined boat



*Close-up of a Warwick ASR lifeboat—in this instance named Vera. In background, an R.A.F. Vultee Vengeance, less wings. (Photo: via Ing. Y. Zahavi, Israel)*

weighed 3,600 lb. and was supported by only two 96-ft. parachutes.

Development flying was completed from Brooklands and R.A.E. Farnborough during the latter part of 1943 using BV228 for handling tests with the Mk. II lifeboat installed. Neither model tests nor the full-scale installation showed any need for fins on the lifeboat for directional stability in the air or the prevention of overturning in the water. Service trials were made at A.&A.E.E. Boscombe Down with BV403 from January 1944, and 205 Warwick ASR. Mk. Is were built.

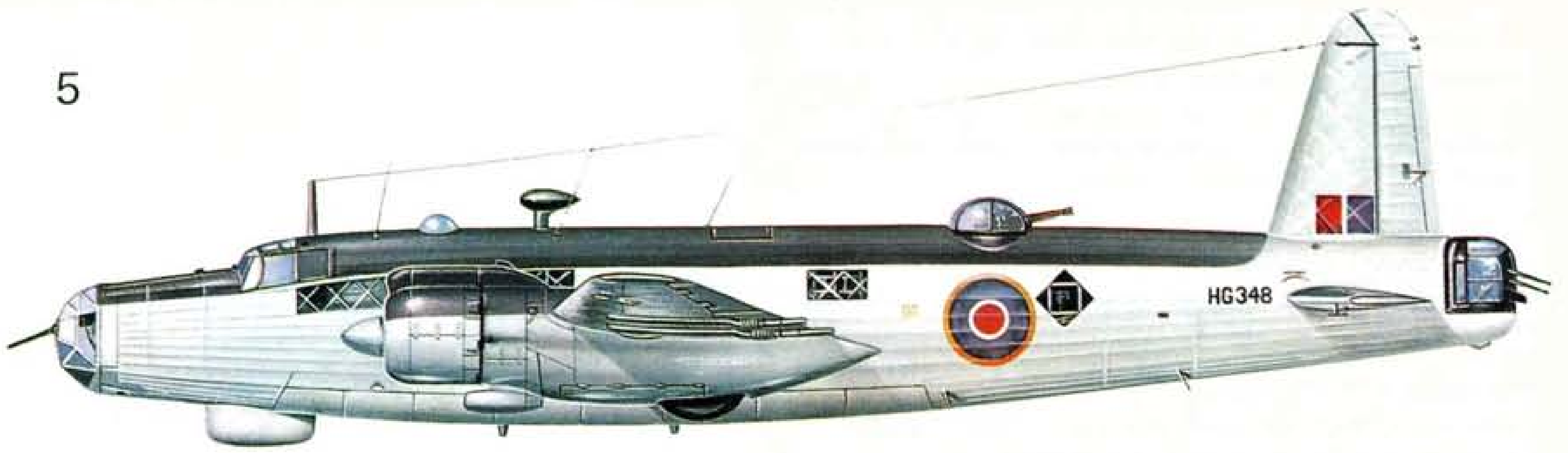
Although the Warwick ASR arrived comparatively late on the scene it did see widespread and successful operational service during the latter part of World War Two. Most ASR Warwicks were active from the



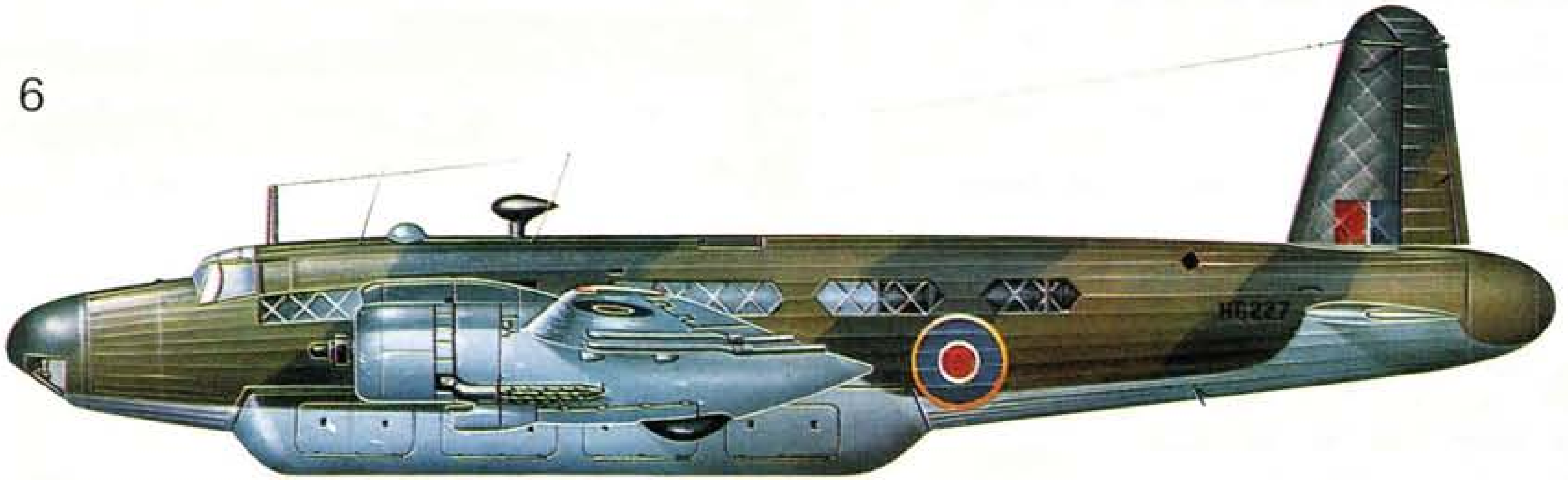
*HF971, a late model Warwick ASR. Mk. I (Tropical) seen at Brooklands just prior to delivery to Kinloss, Scotland, in February 1944. (Photos: Vickers and Air Ministry)*



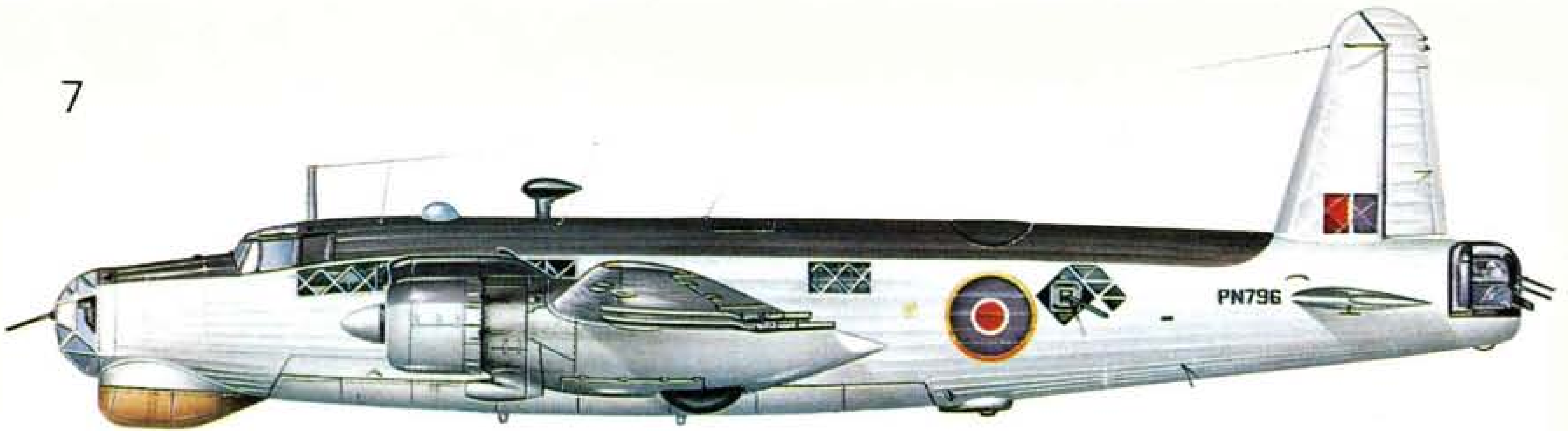
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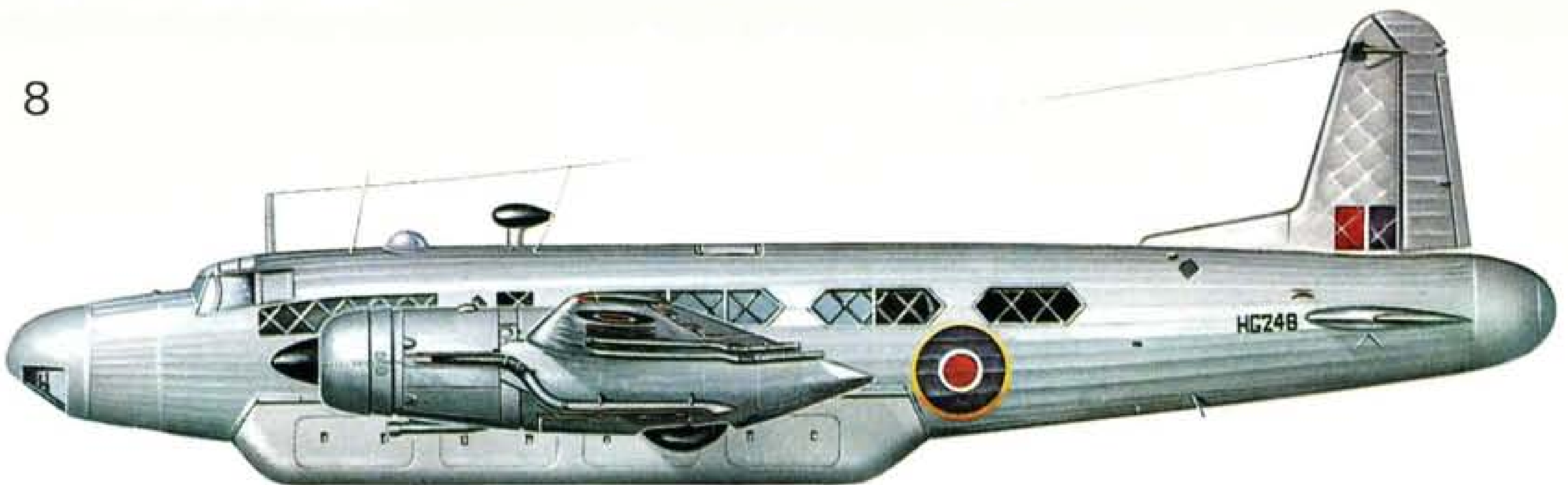
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### Key to colour illustrations

- 5 HG348, the eighth of 118 general-reconnaissance Warwick GR.Mk.IIs (Vickers Type 469) with Bristol Centaurus VIIIs, delivered to R.A.F. Coastal Command in November 1944.
- 6 HG227, the 13th of 100 Warwick C.Mk.IIIs (Vickers Type 460) military transports identified by the distinctive ventral pannier. Powered by P&W Double Wasps. Period: June 1944.
- 7 PN796, the 182nd of 211 Warwick GR.Mk.V (Centaurus VIIIs) to be built. This GR.Mk.V is depicted in March 1944 configuration just prior to fitment of the dorsal fin extension, that became standard for all Warwicks in service, and trial installation of an enlarged 6-ft. diameter ASV radar scanner and radome in place of the standard ventral blister illustrated.
- 8 HG248, a Warwick C.Mk.III (Vickers Type 460) with two Napier Sabre VI liquid-cooled H-type in-line engines which were installed and tested by D. Napier & Son Ltd. at their Luton-based Flight Development Establishment. Period 1945-6.

eastern coastal areas of England where obviously the need for this type of aircraft was greatest and over 3,000 sorties were made over the North Sea and the Bay of Biscay. Others operated in the Middle and Far East.

The operational use of the Warwick ASR has been vividly described by Wing Commander R. H. McIntosh, D.F.C., A.F.C., (Commanding Officer of No. 280 Squadron, R.A.F. in 1943) in his autobiographical book *All-Weather Mac* published by Macdonalds, London, 1963. It is well worth reading.

### WARWICK II – GENERAL RECONNAISSANCE

While the Warwick ASR emerged from the Mk. I bomber, another significant operational rôle was to emerge from the Centaurus-powered Warwick B.Mk. II bomber prototype (BV216) when these more powerful engines began to become available in quantity in 1943—that of general-reconnaissance. Under the designation Warwick GR.Mk. II (Vickers Type 469), two versions were planned; one was to be a torpedo carrier—with three 18-in. or two 24-in. torpedoes or 12,250 lb. of bombs—and the other to incorporate a Leigh-light for night illumination of enemy submarines. Production was to be mainly of the torpedo-carrier. Later, the Leigh-light version was deleted and bombs, mines and depth-charges were substituted. A total of 118 Warwick GR.Mk. IIs was built; and two (HG349 and HG350) were eventually converted to the training rôle in early 1945 (Vickers Type 605 'Post-war Trainer') by No. 26 O.T.U. at Wing in Buckinghamshire.

At the end of 1944 it was decided to use the Warwick GR.Mk. II for meteorological duties and navigation



*Warwick Bomber/ASR (BV227) seen at No. 167 Maintenance Unit, R.A.F., Heliopolis in 1944. (Photo: via author)*



*A Warwick ASR Mk. I 'Stage C' (BV385) also at 167 M.U., Heliopolis, and photographed in 1945. (Photo: via author)*

crew-training for high altitude operation. Modification for this rôle (Vickers Type 611) included deletion of all the bombing gear and gun turrets, the use of the wide-vision nose window introduced on the basic GR.Mk. II and the fitment of crew oxygen equipment. A Warwick (HG362), converted from GR.Mk. II standard, was used for development at Boscombe Down, but of the 96 GR.Mk. II Met. aircraft ordered, only 14 were built and none saw squadron service.

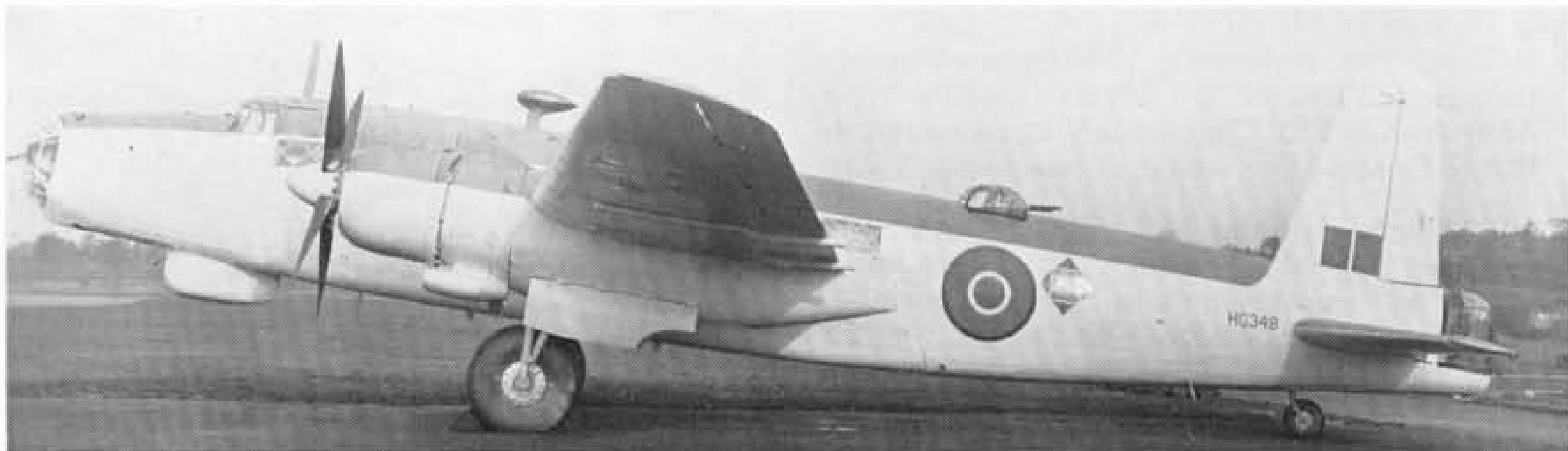
### WARWICK III – TROOP AND FREIGHT TRANSPORT

While, as already described, the capacious fuselage of the Warwick had enabled BOAC's wartime operational needs to be met in 1943, the Warwick ultimately assumed the transport/freighter rôle in substantial numbers in the C.Mk. III version—Vickers Type 460.

Operational requirements called for a multi-rôle vehicle—a concept later used so successfully by Vickers in its Valetta and VC10 transports for the R.A.F. In the troop-transport rôle the Warwick had to be capable of carrying 26 fully-equipped troops, 20 paratroops or 8 to 10 VIP passengers; as a freighter, military cargo and aero-engines; as an air ambulance, six stretcher patients and two medical attendants; or be used for glider towing. In each case the special equipment was to be minimal and be capable of being fitted within 24 hours. Still-air range was to be 2,000 miles at 15,000 ft. and payload was 6,710 lb.

The Warwick C.Mk. III was developed directly from the B.Mk. I using a number of components similar to BOAC's C.Mk. Is but employing P&W Double Wasp R-2800-2SBGs. A Warwick B.Mk. I (BV296) served as this powerplant's flying test bed—the same engines powering the ASR. Mk. VI (Vickers Type 485) mentioned later. Apart from the deletion of armament and associated operating systems, the ventral turret aperture was adapted to form the paratroop exit, the nose and tail turret spaces were replaced by light freight compartments, and the entrances relocated to suit the loading of stretchers. The characteristic external feature of the C.Mk. III was the fitment of a large under-fuselage pannier, in place of the bomb compartment and doors, to contain military equipment





Top and Bottom two illustrations: *Centaurus-powered Warwick GR. Mk. II (HG 348) seen at Brooklands in November 1944.*  
(Photos: Bristol Aeroplane Co.)

*An April 1940 photograph of the Centaurus-powered Warwick's dashboard and throttle box.*  
(Photo: Air Ministry)





The original B.1/35 second prototype (L9704) seen airborne in 1944 during development of remotely-sighted armament for the Windsor—twin barbette guns in the rear of the engine nacelles and the sighting position replacing the tail gun turret.

(Photos: Vickers)

The four Rolls-Royce Merlin-powered Vickers Windsor bomber (first prototype DW506) of 1943 that evolved from Vickers' original Warwick III studies.

(Photo: Vickers)

or four 125 Imp. gal. fuel tanks (Warwick ASR. Mk. I HF957 was used for the trial installation). A clear-vision panel was also fitted under the nose for observation of paratroop dropping.

The first of the 100 production Warwick C.Mk. IIIs was HG215 which was evaluated at Boscombe Down—from April to October 1944—at all-up weights ranging from 40,000 lb. for the air-ambulance to 45,000 lb. for the freighter.

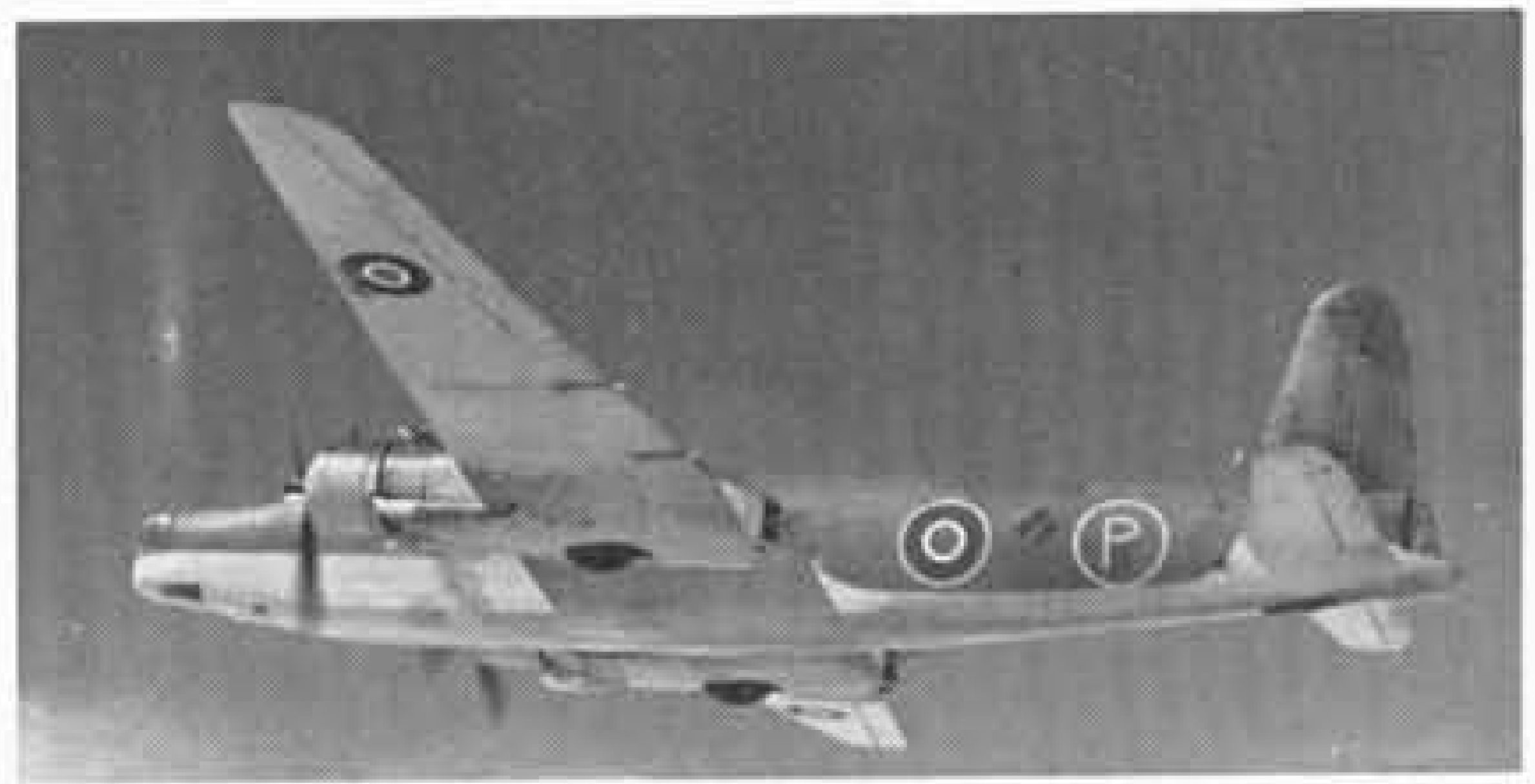
Detailed testing included performance, cabin heating and ventilation, and air ambulance trials. This work was directly relevant, through the later 'Warwick Continental' passenger transport study, to Vickers' emerging commercial transport aspirations with the end of the war now in sight.

The first Warwick C.Mk. III to be delivered for squadron service was HG219 which arrived at No. 525 Squadron, R.A.F. at Lyneham on June 24, 1944, and 11 more followed during the ensuing month.

Meanwhile HG252 and HG330 were used for a range of tests from September 1944 at A.&A.E.E. Boscombe Down and R.A.E. Farnborough to check the revised Warwick V tail unit and, by April 1945, the Warwick V main and dorsal fin were declared the standard for subsequent C.Mk. IIIs.

Of the several problems experienced by No. 525 Squadron, the most significant was the lifting of upper surface fabric already experienced on earlier Warwicks. Heat-cracking of the top-surface fabric rendered the C.Mk. III unsuitable for use in the Far East theatre and it was thus confined to the United Kingdom-Middle East routes and used by R.A.F. Transport Command to operate a regular mail and freight service between the U.K. and Athens via Naples from early 1945 until withdrawn from service in March 1946.

High-altitude pressurized-cabin developments of the Warwick, comparable to the Wellington Marks V and VI, had been studied in 1941 in relation to Air Ministry



Specification B.5/41 under Vickers Type 433 which was also known at that time as 'Warwick III'. These were intended to enable the achievement of a ceiling of 40,000 ft., out of reach of any contemporary fighter. Alternative powerplants considered were two specially-modified Bristol Centaurus or four Rolls-Royce Merlin 60s. The four-Merlin project ultimately became hardware as the bigger Vickers 'Windsor' bomber of 1943.

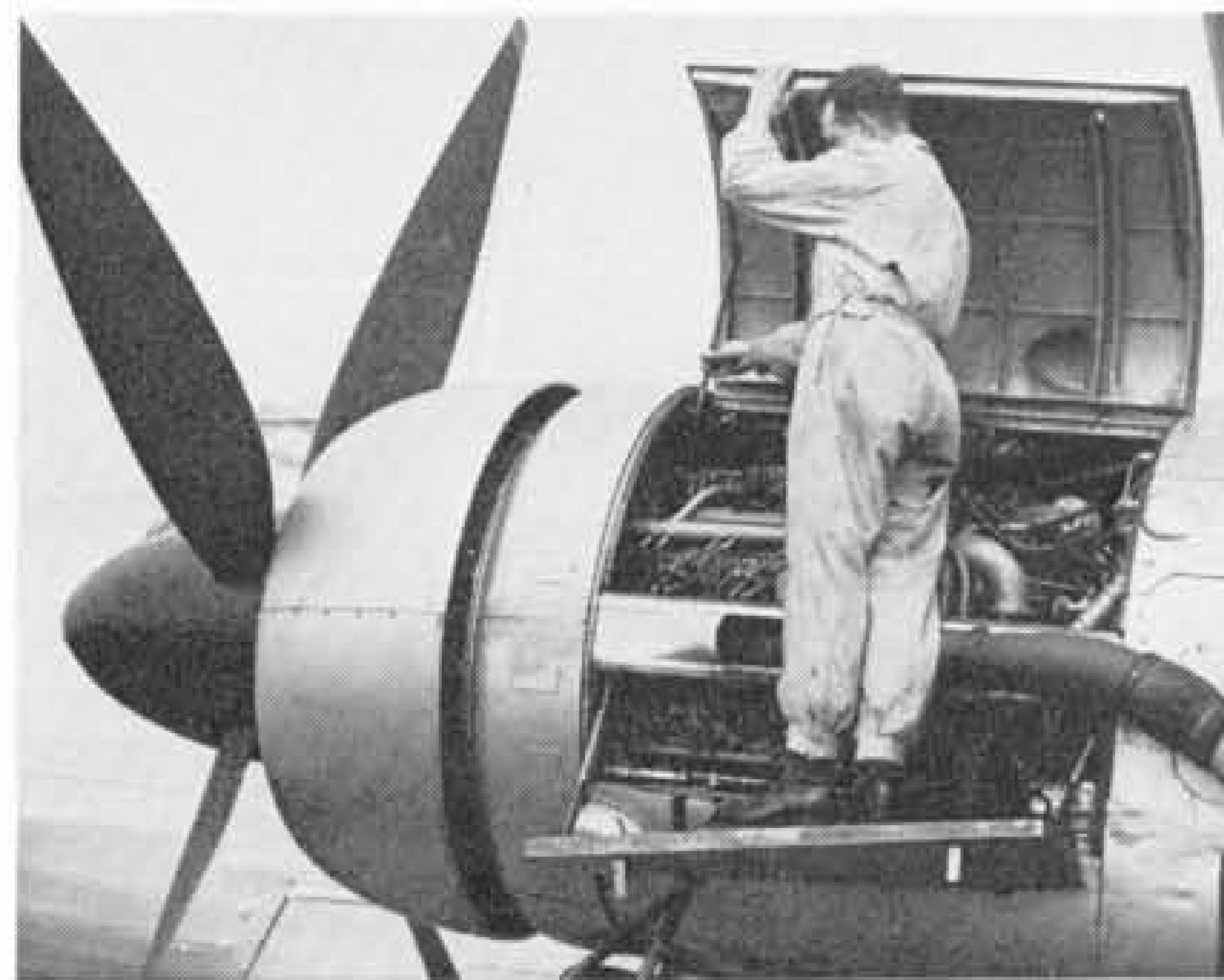
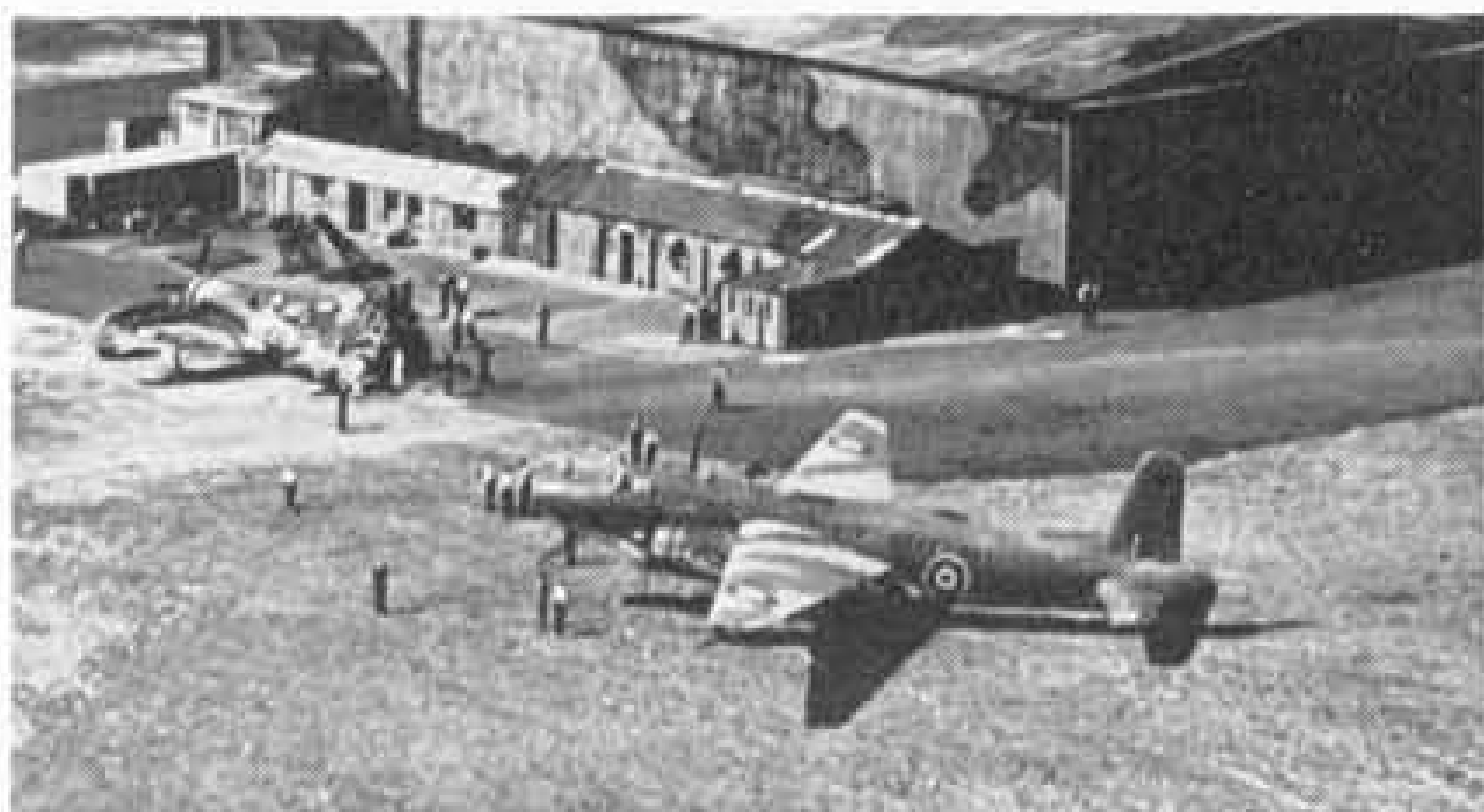
The original second prototype Warwick (L9704) was still active in 1944 for the trial installation and development of the remotely-controlled armament for the Windsor (under Vickers Type 468). Twin 0.50-in. Browning machine-guns in barbettes were located in the rear of the P&W Double Wasp engine nacelles; with the sighting position replacing the rear gun turret.

#### WARWICK IV – STILLBORN

After Vickers own 'Warwick IV' (Type 438) transport study of 1942, the official Warwick C.Mk. IV designation of 1944 was to be a transport version of the Centaurus-powered Warwick II to parallel the rôles of the P&W-powered C.Mk. III—with Centaurus IV engines (as in BV216, the B.Mk. II prototype) instead of the Double Wasp R-2800s as the Vickers Type 484, but this never materialized.

#### WARWICK V – GENERAL RECONNAISSANCE

Soon after the Warwick GR.Mk. II Met. was started the Leigh-light was reintroduced for night use of the Warwick by R.A.F. Coastal Command. This led Vickers to evolve what was later officially designated the Warwick GR.Mk. V under its own Type Numbers 473 (Day) and 474 (Night). Powered by two 2,500 h.p. Bristol Centaurus VII engines, the all-up weight for the GR.Mk. V was initially increased to 49,000 lb.; but,



*Close-up of the Napier Sabre VI engine installation in Warwick C.Mk. III HG248 with the cooling fan for the annular radiator evident and the exhaust stack extension fitted later during the test programme. (Photos: D. Napier & Son Ltd.)*

*Warwick C.Mk. III (HG248) and similar annular radiator prototype Hawker Tempest, seen here at Napier's Flight Development Establishment at Luton in 1945 where it had Sabre VI engines fitted for development flying for possible post-war civil use. (Photo: Flight ref. 19426S)*

by October 1944, this had further increased to 51,250 lb. The GR.Mk. V was the ultimate production version of the Warwick.

Retaining the general characteristics of its predecessors, the GR.Mk. V carried the anti-submarine Leigh-light in a ventral position behind the bomb-bay and a radar scanner in a fairing under the forward fuselage for anti-submarine patrol duties.

The main external differences from the GR.Mk. II were the revised nose, a dorsal fin (discussed later), and the replacement of the mid-upper gun turret with two beam guns (which reduced drag and increased range by 170 nautical miles). The all-0.303-in. armament of earlier Warwicks gave way to only four guns of this calibre in the power-operated tail turret, but complemented with three 0.50-in. Browning machine-guns—one in the multi-faceted Perspex nose, one on each side of the fuselage in beam positions, mid-way between the wings and tail. This armament was initially tested on PN760.

Maximum speed for the GR.Mk. V was 298 m.p.h. at 3,500 ft. and 288 m.p.h. at sea-level. Normal cruising speed was 264 m.p.h. at 9,500 ft. and range was 3,050 miles at 161 m.p.h. Maximum bomb load was 6,000 lb. and maximum mine load 8,600 lb.

Because of the overdue delivery of the Leigh-light, these lights had to be fitted at a fixed inclination of seven degrees.

The first GR.Mk. V production authorization was for 100 aircraft, beginning with PN697 which was flown in April 1944. Type trials were completed at A.&A.E.E., Boscombe Down and service trials at R.A.F. Hullavington, in Wiltshire.

Despite the mass of handling tests made throughout the life of the Warwick to overcome directional

instability, this problem still persisted in the Warwick GR.Mk.V. Consequently, four aircraft (PN761, PN765, PN775 and PN777) were used simultaneously in February 1945 to find a 'once-and-for-all' solution.

Eventually, it was a dorsal fin fitted to PN710 by the R.A.E. at Farnborough the following month—together with reduced rudder trim tab travel—that finally cured the problem (of aerodynamic over-balance of the rudder at large sideslip angles) which had dogged the Warwick for a decade and resulted in numerous accidents and the loss of several aircraft and lives.

So successful were these modifications that they were retrospectively applied to all Warwicks in service.

The first Warwick GR.Mk. Vs were supplied to No. 179 Squadron, R.A.F. Coastal Command at St. Eval (Cornwall) at the beginning of 1945. In addition to training duties with Operational Training Units in the U.K., the Warwick GR.Mk. V also served in the Middle East (with M.A.A.F., the Mediterranean Allied Air Forces) and in South Africa with Nos. 17 and 27 Squadrons, South African Air Force.

The rapid ending of the war in 1945 meant that that Warwick GR.Mk. V only saw a very short spell of active service. However, it remained with R.A.F. Coastal Command for a period after the cessation of hostilities. Production ended in May 1946 after 211 had been built.

Various GR.Mk. Vs were used for trials of special technical features and one (PN703) was used for a time by BOAC (as G-AGLD), to gain experience of operation of the Centaurus engine. First flown at Brooklands on August 25, 1944, the Centaurus VII-powered G-AGLD was granted a civil certificate of



airworthiness on October 17, 1944 whence it joined the BOAC Development Flight at Hurn (Bournemouth, Hampshire) making a proving flight to South Africa in October 1945.

### WARWICK VI – AIR-SEA RESCUE

A further production batch of 95 Warwick ASRs, designated Warwick ASR.Mk. VI (Vickers Type 485) was authorized in 1943. The main difference from its predecessors was the substitution of the Double Wasp R-2800-2SBG engines for the R-2800-S1A4-G. This engine was also being used in the contemporary Warwick C.Mk. III described earlier.

The Warwick ASR.Mk. VI was still known as 'ASR.Mk. I' in the R.A.F. The final batch of about 20 aircraft was held in reserve pending an anticipated need in the Pacific campaign which did not materialize.

HG141 was set aside in March 1944 as the test-bed for the Centaurus VII engine, the basic type of the Warwick GR.Mk. II and V already described.

### ULTIMATE DEVELOPMENTS

Various Warwicks were used in the immediate post-war period for engine development flying of later versions of the Bristol Centaurus and of the Napier Sabre for possible civil applications.

The first five Warwick GR.Mk. IIs (HG341 to HG345) were used in 1944 as test-beds for the Centaurus XII installations for the Airspeed AS.57 Ambassador, the Short Shetland and other potential developments of this engine under Vickers Type Number 600.

Whereas the Napier Sabre had been one of the three alternative engines proposed for the Warwick at the prototype stage in 1937, it was not until 1945 that this engine was actually tested in the Warwick. A C.Mk. III (HG248) was converted by D. Napier & Son Ltd. at their Flight Development Establishment at Luton (Bedfordshire), and fitted with Sabre VI engines, incorporating annular radiators and cooling fans. This aircraft was displayed at the S.B.A.C. Exhibition at Radlett (Hertfordshire) in 1946.

*"Napier's" Warwick C.Mk. III HG248 seen still in its drab military paint soon after conversion to Napier Sabre engines in 1945.*

(Photos: Napier & Air-Britain Photo Library ref. A3015)

Another Warwick C.Mk. III (HG336) was used for high-altitude testing of the Pratt & Whitney R-2800-S7 engine fitted with a GEC turbo-blower.

The ultimate Warwick proposal (Vickers Type 606) was intended for in-flight refuelling but this was not proceeded with.

### THE 12-YEAR SAGA OF THE WARWICK

Of the 1,178 Warwicks originally ordered, 846 were built, all of them at Weybridge. The total cost of the programme was around £14½ million—equivalent to an average cost of approximately £17,000 per aircraft.

After the exceptionally long gestation period of seven years from Vickers initial tender for the original B.1/35 specification in October 1935 until the first service delivery at the end of 1942, the Warwick continued in production at Weybridge for 3½ years.

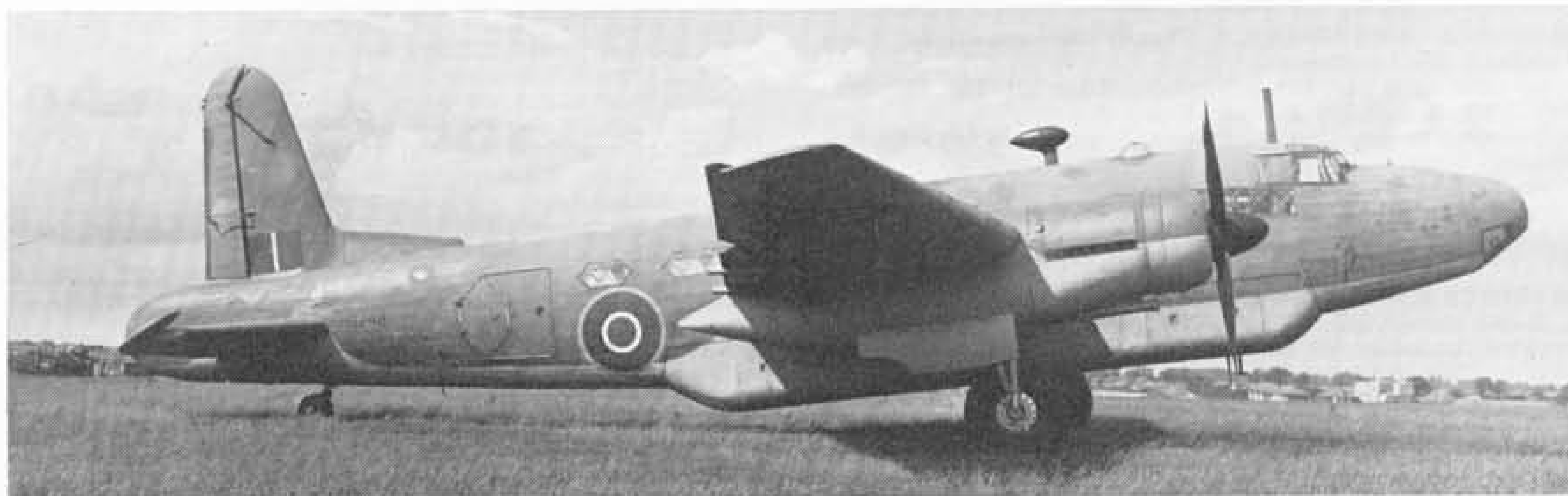
After two initial prototypes, 500 Warwicks were produced with Pratt & Whitney Double Wasp engines and a further 344 were built with the Bristol Centaurus.

The first Warwick to be delivered to the Royal Air Force was BV220, a B.Mk. I, which went to No. 33 Maintenance Unit at Lyneham (Wiltshire) on December 15, 1942. The last was LM907, a GR.Mk. V to No. 45 M.U. at Kinloss (Moray, Scotland) on June 3, 1946; the type was eventually withdrawn completely in November 1947. Thus the total Warwick saga spanned no fewer than 12 years.

#### Acknowledgments

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Series Editor: CHARLES W. CAIN





*Warwick C.Mk. III HG248 seen in January 1947 in its all-silver post-war paint scheme. (Photos: Air Ministry)*

**WARWICK PRODUCTION SUMMARY, SQUADRON ALLOCATIONS AND SPECIAL PURPOSE CONVERSIONS.**

The following notes list production details of each major Warwick variant (in numerical order) and the operational use of individual aircraft so far as surviving records permit.

Original Vickers tender for Air Ministry Specification B.1/35 submitted July 2, 1935.

First prototype B.1/35 (K8178) ordered October 7, 1935.

Second prototype B.1/35 (L9704) ordered July 2, 1937.

**WARWICK B.Mk. I Total built: 16.**

Serials: BV214 to 215; 217 to 222; 224; 228 to 230; 291; 293; 295; 296. Individual aircraft:

Several used for tests by Vickers, R.A.E. Farnborough and A. & A.E.E. Boscombe Down. Of particular note were:

BV214 and BV215: Written-off during initial test flying.

BV217: Used for engine cooling tests and eventually in late 1944 for investigation of rudder characteristics for the Vickers Type 491, the VC1 Viking post-war airliner.

BV224: Various technical trials.

BV228: Used for trial installation of airborne lifeboats.

BV229 and BV291: Eventually to No. 5 (c) O.T.U.

BV295: Checks of carbon-monoxide contamination at crew positions.

BV296: Converted to special A.S.R. rôle and fitted with P&W Double Wasp R-2800-2SBG engines; June 1944 tested at A. & A.E.E. for initial clearance of A.S.R. and transport versions so fitted.

**WARWICK C.Mk. I Total: 14—converted from surplus B.Mk. I airframes.**

Serials BV243 to BV256 inclusive—converted for BOAC and given civil registrations G-AGEX to G-AGFK inclusive, G-AGFJ and G-AGFK had different cabin windows. All delivered to BOAC between May 6 and November 1, 1943 and used on the North Africa and Mediterranean routes. All withdrawn from the overseas services on April 27, 1944, and transferred to No. 167 Squadron, R.A.F. at Holmesley South with original military serials and eventually to No. 525 Squadron, R.A.F. at Lyneham in 1944.

**WARWICK BOMBER/A.S.R. Total: 40—converted from surplus B.Mk. I airframes.**

Serials: BV223; 225; 227, 231 to 241; 269 to 281; 283; 285; 287; 289; 297; 299; 300; 305; 310; 315; 316; 332.

Converted to carry Lindholme gear only. Squadrons and individual aircraft:

No. 279 Sqn: BV233; 287; 305; 310; 316.

No. 283 Sqn: BV235; 236; 240; 241; 280; 289; 297.

No. 293 Sqn: BV225; 238; 297.

**WARWICK A.S.R. 'STAGE A' Total built: 10.**

Serials: BV242; 282; 284; 286; 298; 301 to 303; 333; 334. All had modified bomb-bay and -doors for carrying two sets of Lindholme gear and 'Mk. I Lifeboat'—first BV298. Squadrons and individual aircraft:

No. 280 Sqn: BV282; 284; 286.

No. 281 Sqn: BV284; 303.

Other Units:

No. 5 (c) O.T.U.: BV286; 302; 333; 334.

**WARWICK A.S.R. 'STAGE B' Total built: 20.**

Serials: BV288; 290; 304; 306 to 309; 311 to 314; 335 to 341; 351; 352. All could carry the 'Mk. I Lifeboat' or two sets of Lindholme gear.

Squadrons and individual aircraft:

No. 281 Sqn: BV304; 308; 309; 311; 335; 337.

No. 282 Sqn: BV288.

Other Units:

To Middle East: BV341; 382.

No. 5 (c) O.T.U.: BV311; 313.

**WARWICK A.S.R. 'STAGE C' (later designated A.S.R. Mk. I) Total built: 149.**

Serials: BV292; 294; 342 to 350; 353 to 370; 384 to 421; 436 to 484; 499 to 531. Squadrons and individual aircraft:

BV403: Used for initial service trials at A. & A.E.E.

No. 269 Sqn: BV483; 499; 507; 508; 519.

No. 276 Sqn: BV479; 527; 530; 531.

No. 277 Sqn: BV527.

No. 278 Sqn: BV528; 529.

No. 279 Sqn: BV392; 516; 518.

No. 280 Sqn: BV346; 349; 386; 414.

No. 281 Sqn: BV345; 367; 384; 386; 392; 401; 404; 409 to 411; 413 to 414; 417 to 419; 438 to 440.

No. 282 Sqn: BV477; HF944; 950; 952; 959; 961 to 964; 967; 969; 974.

No. 283 Sqn: BV441; 450; 472; 504; 526.

No. 292 Sqn: BV394; 452 to 453; 456; 463.

No. 293 Sqn: BV365; 415; 420; 449; 457; 464; 502; 505.

Other Units:

No. 5 (c) O.T.U.: BV348; 355; 391; 393; 406; 412; 470; 506; 511; 518.

No. 6 O.T.U.: BV512; 531.

**WARWICK A.S.R. Mk. I Total built: 56.**

Serials: HF938 to 982; HG124 to 134. Squadrons and individual aircraft:

No. 269 Sqn: HF938; 940.

No. 276 Sqn: HF938; 940; 960.

No. 277 Sqn: HF938; 940; 960.

No. 278 Sqn: HF961; 962; 967; 968; 976.

No. 279 Sqn: HF948; 961; 963; 964; 978; 981.

No. 280 Sqn: HF947; 962; 963; 967; 976; 977; 979.

No. 282 Sqn: HF976 to 980.

No. 283 Sqn: HF966; HG134.

No. 292 Sqn: HF954; 966; 970; 972; HG133.

No. 293 Sqn: HF955; 958; HG131; 132.

HF957 used for trial installation of freight panniers for C.Mk. III.

Other Units:

No. 5 (c) O.T.U.: HF939; 946.

No. 6 O.T.U.: HF938; 940; 946; 960; 981.

**WARWICK B.Mk. II (Prototype) Total built: 1 (BV216).**

**WARWICK GR. Mk. II Total built: 118.**

Serials: HG341 to 365; 384 to 414; 435 to 459; 476 to 512. Special conversions:

HG341 to HG345: Used as test-beds for Bristol Centaurus engine installations for post-war civil applications as follows:

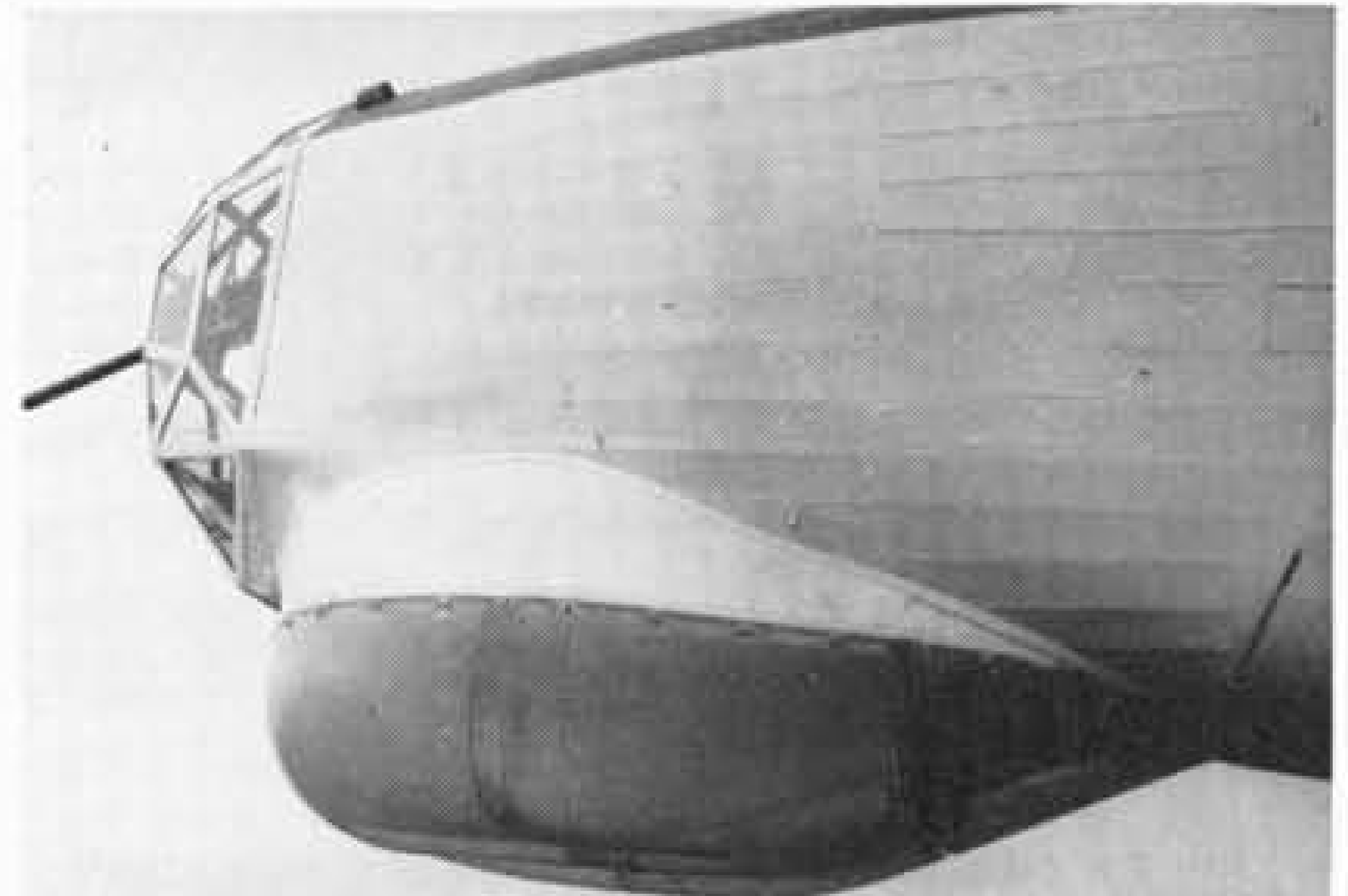
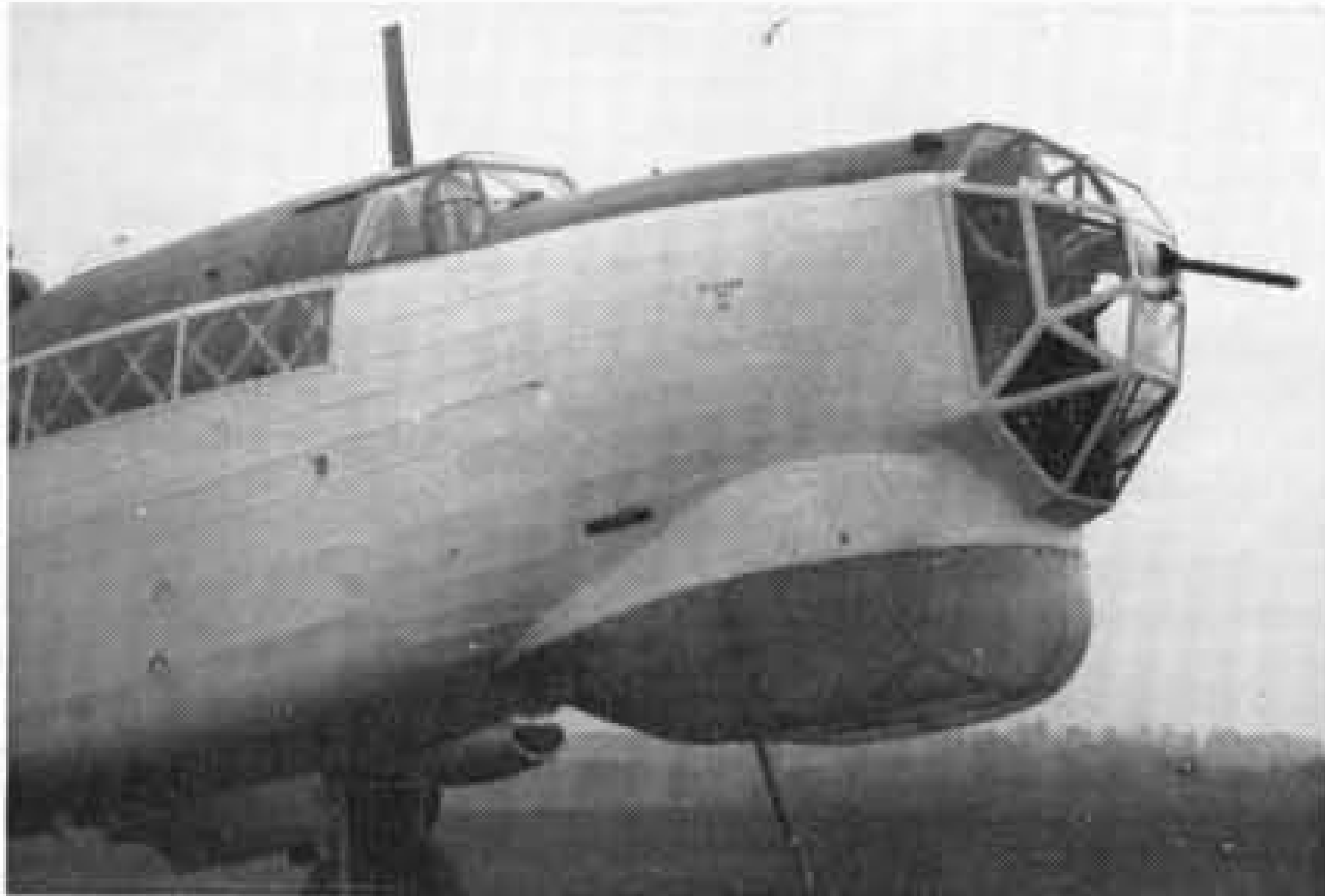
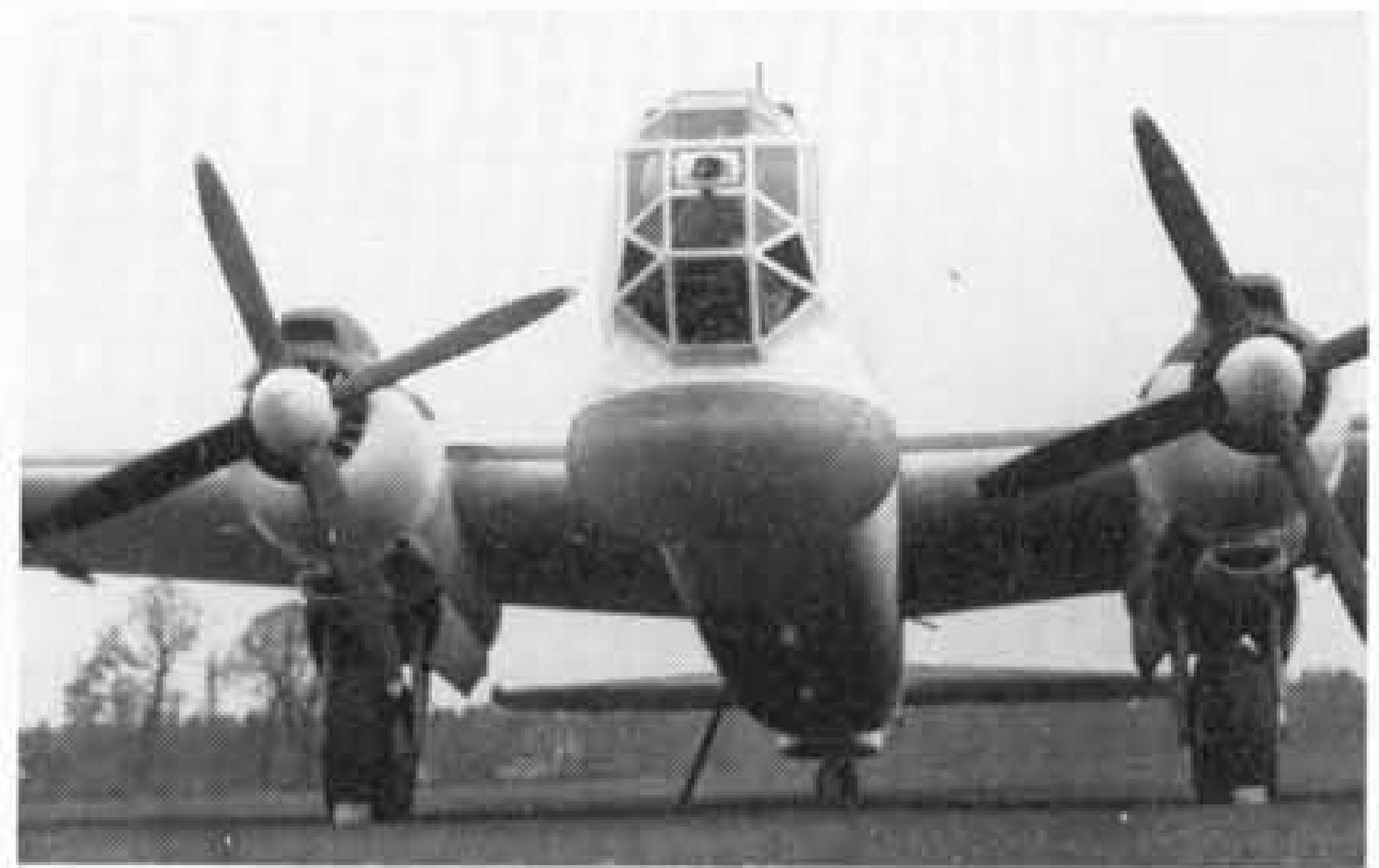
HG341: Centaurus 130s for Airspeed Ambassador.

HG342: Centaurus XlIs.





Details of the special ASV radar installation with 6-ft. diameter scanner mirror on Warwick ASR. Mk. V PN796 which was converted at Weybridge and delivered to T.R.E. (Telecommunications Research Establishment) Defford, on March 17, 1945. Note also the revised, multi-faceted, nose turret fitted to all general reconnaissance Warwicks (Mks. II and V).



HG343: Centaurus XII and 57s for Short Shetland.  
 HG344: Engine trials at Bristols.  
 HG345: Centaurus XII by Bristols.  
 Squadrons and individual aircraft:  
 No. 524 Sqn: HG348.  
 Other Units:  
 No. 6 O.T.U.: HG402; 442; 443; 446 to 448; 450; 451; 453; 481 to 483; 487.  
 No. 26 O.T.U.: HG349; 350 (converted to trainers).  
 Empire Air Navigation School (Shawbury) and Empire Air Armament School (Manby): HG347.  
 HG362: Converted for development of GR. Mk. II Met. at A.&A.E.E.  
 Remainder to storage.

**WARWICK GR.Mk. II Met. Total built: 14.**

Serials: HG513 to 525; 539.  
 Sqns: Nil. All to storage with No. 45 M.U.

**WARWICK C.Mk. III Total built: 100.**

Serials: HG215 to 256; 271 to 307; 320 to 340.  
 Squadrons and individual aircraft:  
 No. 167 Sqn: HG219 to 221; 227 to 231; 234; 235; 237; 278 to 280.  
 HG282 to 297; 301; 302; 305; 320; 321; 323; 325; 327.  
 No. 297 Sqn: HG277.  
 No. 301 (Polish) Sqn: HG225; 226; 236; 275; 276; 281; 289; 293; 299; 322.  
 No. 304 Sqn: HG231; 233; 246; 273; 282; 292; 294; 295; 297; 298; 300; 306; 307; 324; 326; 329; 332; 334 to 340.  
 No. 525 Sqn: HG219; 220; 223; 224; 226 to 233.  
 To S.E. Asia: HG222; 238; 239; 241; 243 to 247; 249 to 251; 253; 255; 256; 272; 274; 288.  
 Conversion, Research & Development:  
 A.&A.E.E.: HG215; 217; 218; 252; 330.  
 HG248: Fitted Napier Sabre VI engines by Napiers at Luton.

**WARWICK GR.Mk. V Total built: 211.**

Serials: LM777 to 803; 817 to 858; 870 to 909; PN697 to 725; 739 to 782; 796 to 824.  
 Squadrons and individual aircraft:  
 Most of first batch to storage except the following:  
 CRD. Defford: LM777.  
 M.A.A.F.: LM779; 781; PN704; 706; 707; 713; 720; 775; 779; 781 797; 799. Several went to South Africa.  
 No. 179 Sqn: LM791 to 797.  
 R.A.E. Farnborough: LM855.  
 LM818: Fitted with special nose scanner with clear Perspex radome.  
 A.&A.E.E.: PN697; 698; 701; 707; 710; 760.  
 PN703: Registered as G-AGLD with civil certificate for BOAC.  
 No. 17 Sqn. (S.A.A.F.): PN704; 706; 723; 741; 742; 755; 757; 770; 782.  
 No. 27 Sqn. (S.A.A.F.): PN704; 723; 741; 742; 751; 753 to 756; 758; 759; 761; 763; 765; 766.  
 No. 179 Sqn: PN709; 711; 712; 715 to 717; 721; 722; 739; 743; 747 to 750; 800 to 811.

The aircraft of Nos. 17 and 27 Squadrons, S.A.A.F. on return of the squadrons to South Africa, took their aircraft with them.

**Conversion, Research & Development aircraft:**

PN697: Centaurus VII cooling and performance trials.  
 PN700: Vickers trials and installation of Mk. VIII auto controls and revised installation of FN77 Mk. II gun turret.  
 PN710: Dorsal fin development at A.&A.E.E.  
 PN699 and 776: At R.A.E. for trials of Mk. VIII auto controls.  
 PN760: Trial installation of beam guns.  
 PN761; 765; 775 and 777: Directional stability tests.  
 PN796: Trial installation of enlarged nose radar scanner.  
 PN773; 777; 778; 780 and LM901: Crashed on test flights in early 1945 before delivery and were thus not contracted for (but are included in total above).

**WARWICK A.S.R.Mk. VI Total built: 95.**

Serials: HF983 to 987; HG114 to 123; 135 to 156; 169 to 193; 207 to 214; PN825 to 839; 853 to 862.  
 Squadrons and individual aircraft:  
 No. 251 Sqn: HG174; 179; 184.  
 No. 269 Sqn: HG136; 138; 142; 146; 156; 171; 174; 179; 192; PN862.  
 No. 279 Sqn: HF983; 985; 986; HG118; 142; 144; 151; 169 to 171; 173; 176; 177; 180; 181; 189; 193; 207; 209 to 210; 212; 214.  
 No. 280 Sqn: HF984 to 987; HG114 to 115; 119; 121; 123; 136 to 138; 140; 142; 144 to 156; 170; 171; 173 to 176; 178; 180; 182; 187; 188; 190; 192; 208; 211; 214; PN862.  
 No. 281 Sqn: HF985 to 986; HG116 to 119; 121; 136; 144; 151; 169; 170; 172; 176; 183; 193; 213.  
 No. 282 Sqn: HG114; 120; 135; 136; 155.  
 No. 520 Sqn: HG114; 122; 135; 139; 155; 179; 185; 186; PN828.  
 No. 5 (c) O.T.U.: HF984; 987; HG115 to 117; 121 to 123; 190.  
 No. 6 O.T.U.: HG115; 117; 121; 122; 173; 177; 181.  
 PN829 to 861: Delivered to storage.  
 HG141: Second Centaurus-powered prototype—used as test bed for Bristol Centaurus VII.

**Cancelled serials:**

DW115 to DW502 (original production contract of December 28, 1940 which was later amended to cover the types actually built). The following serial batches (total 332 aircraft) were cancelled during the production cycle:  
 HG538; 540 to 585; 599 to 633; LM769 to 776; 910 to 913; 927 to 968; 980 to 997; LN110 to 114; PN623 to 667; 681 to 696; 863 to 898; 910 to 952; 964 to 996.

**SUMMARY:** of the total of 1,178 Warwick ordered, 846 were actually built as follows:

Two initial prototypes; 16 B.Mk. I; 14 C.Mk. I (for BOAC); 40 Bomber/ASR; 10 ASR. 'Stage A'; 20 ASR. Stage B'; 205 ASR.Mk. I; one prototype B.Mk. II; 118 GR.Mk. II; 14 GR.Mk. II Met.; 100 C.Mk. III; 211 GR.Mk. V; 95 ASR.Mk. VI.

## VICKERS WARWICK TYPE NUMBERS

Vickers Type Number	Designation	Powerplant	Details
284	B.1/35	2 × Rolls-Royce Vulture	First prototype K8178
400	B.1/35	2 × Napier Sabre	Schemed for K8178
401	B.1/35	2 × Bristol Centaurus CEISM	Second prototype L9704
411	B.1/35	2 × Rolls-Royce Vulture II	Production (design study only)
413	Warwick B.Mk. II	2 × Bristol Centaurus IV	Production standard; BV216 converted as prototype
422	Warwick B.Mk. I	Two P&W Double Wasp R-2800-S1A4-G	Production standard; first BV214
427	Warwick I	Two P&W Double Wasp R-2800-S1A4-G	L9704 conversion
433	Warwick III	4 × Rolls-Royce Merlin 60	B.5/41 project study of Windsor predecessor
438	Warwick IV	2 × P&W Double Wasp R-2800	Vickers own transport project
444	Warwick		Special heavy-bomber project
456	Warwick C.Mk. I	2 × P&W Double Wasp R-2800-S1A4-G	BOAC; G-AGEX to G-AGFK
460	Warwick C.Mk. III	2 × P&W Double Wasp R-2800-2SBG	Transport version—production standard. See also Type 485
462	Warwick ASR.Mk. I	2 × P&W Double Wasp R-2800-S1A4-G	Air-Sea rescue version—production standard
468	Warwick I	2 × P&W Double Wasp R-2800-S1A4-G	Conversion of L9704 with nacelle rear barbette guns for Windsor
469	Warwick GR.Mk. II	2 × Bristol Centaurus VII	General reconnaissance version—production standard
472	Warwick C.Mk. I	2 × P&W Double Wasp R-2800-S1A4-G	Interim freighter study
473	Warwick GR.Mk. V	2 × Bristol Centaurus VII	General reconnaissance—day version
474	Warwick GR.Mk. V	2 × Bristol Centaurus VII	General reconnaissance—night version
484	Warwick C.Mk. IV	2 × Bristol Centaurus IV	Not built
485	Warwick ASR. Mk. VI	2 × P&W Double Wasp R-2800-2SBG	Production version with alternative P&W engine to Type 462. See also Type 460
497	Warwick T.Mk. 3	2 × Bristol Hercules VI	Interim trainer project study—adapted from Type 460
600	Warwick GR.Mk. II	2 × Bristol Centaurus XII	Engine test-bed conversion for Airspeed Ambassador and Short Shetland
605	Warwick	2 × Bristol Centaurus	Post-war trainer project
606	Warwick	2 × Bristol Centaurus	Flight refuelling project
611	Warwick GR.Mk. II Met.	2 × Bristol Centaurus VII	Meteorological version—production standard developed from Type 469

## WARWICK PRODUCTION AND DELIVERY SUMMARY

Variant	1939	1940	1941	1942	1943	1944	1945	1946	Totals
Initial prototypes	1	1	—	—	—	—	—	—	2
B.Mk. I	—	—	—	6	10	—	—	—	16
C.Mk. I (B.O.A.C.)	—	—	—	—	13	1	—	—	14
*Bomber/ASR	—	—	—	—	40	—	—	—	40
*ASR 'Stage A'	—	—	—	—	10	—	—	—	10
*ASR 'Stage B'	—	—	—	—	20	—	—	—	20
*ASR.Mk. I	—	—	—	—	138	67	—	—	205
B.Mk. II Prototype	—	—	—	—	1	—	—	—	1
GR.Mk. II	—	—	—	—	—	17	88	13	118
GR.Mk. II Met.	—	—	—	—	—	—	—	14	14
C.Mk. III	—	—	—	—	—	87	13	—	100
GR.Mk. V	—	—	—	—	—	56	133	22	211
*ASR.Mk. VI	—	—	—	—	—	69	25	1	95
<b>TOTALS</b>	<b>1</b>	<b>1</b>	<b>—</b>	<b>6</b>	<b>232</b>	<b>297</b>	<b>259</b>	<b>50</b>	<b>846</b>

\*All known as 'ASR.Mk. I' in R.A.F. service.

## SPECIFICATION DETAILS OF PRINCIPAL WARWICK VARIANTS

Type Designation	B.Mk. I	C.Mk. III	ASR.Mk. I	GR.Mk. V
Vickers Type Number	422	460	462	473/4
Operational Role	Bomber	Transport and Troop Carrier	Air-Sea Rescue	General Reconnaissance
Special Features	Datum	Large under-fuselage freight pannier	Para-lifeboat carried under centre fuselage	Leigh-light in ventral position and ASV radar in fairing under nose
Accommodation	Pilot and 5 crew	Crew of 3; 26 troops or 20 paratroops or 8 to 10 VIPs or 6,710 lb.	Pilot and 6 crew	Pilot and 6 crew
Armament	Twin 0.303-in. guns in nose and dorsal turrets and four 0.303-in. guns in tail turret	None	As B.Mk. I	One 0.50-in. gun in nose and two in beam positions plus four 0.303-in. guns in tail turret
Powerplant	Two 1,850 h.p. Pratt & Whitney Double Wasp R-2800-S1A4-G	Two 1,850 h.p. Pratt & Whitney Double Wasp R-2800-2SBG	Two 1,850 h.p. Pratt & Whitney Double Wasp R-2800-S1A4-G	Two 2,520 h.p. Bristol Centaurus VII
Dimensions:				
Span	96 ft. 8½ in.	96 ft. 8½ in.	96 ft. 8½ in.	96 ft. 8½ in.
Length	72 ft. 3 in.	70 ft. 6 in.	72 ft. 3 in.	73 ft. 0 in.
Height	18 ft. 6 in.	18 ft. 6 in.	18 ft. 6 in.	18 ft. 6 in.
Gross Wing Area	1,006 sq. ft.	1,006 sq. ft.	1,006 sq. ft.	1,006 sq. ft.
Weights:				
Tare	28,450 lb.	27,750 lb.	28,800 lb.	32,090 lb.
Load	6,000 lb. bombs	6,710 lb.	Mk. I Lifeboat 1,700 lb. or Mk. II Lifeboat 3,600 lb.	6,000 lb. bombs or 8,600 lb. mines
Gross	45,000 lb.	45,000 lb.	46,000 lb.	51,250 lb.
Performance:				
Cruise Speed	210 m.p.h.	185 m.p.h. at 10,000 ft.	150 m.p.h.	264 m.p.h. at 9,500 ft.
Max. Speed	224 m.p.h.	220 m.p.h. at 11,000 ft.	206 m.p.h. at 11,000 ft.	298 m.p.h. at 3,500 ft. 288 m.p.h. at sea level
Service Ceiling	17,000 ft.	17,000 ft.	17,000 ft.	19,000 ft.
Max. Range	2,000 miles	2,150 miles with 6,710 lb. freight	2,300 miles	3,050 miles