PROFILE

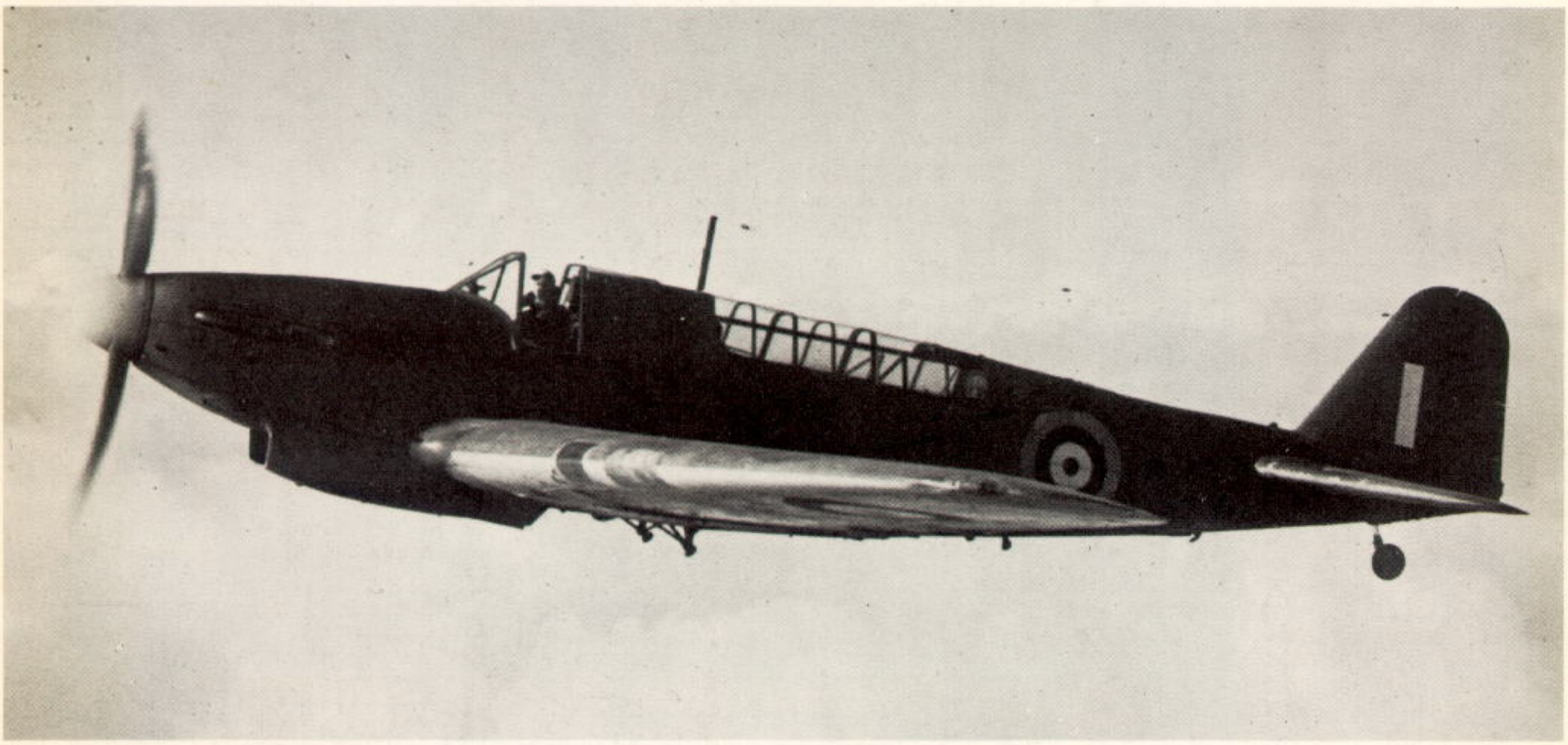
Aircraft

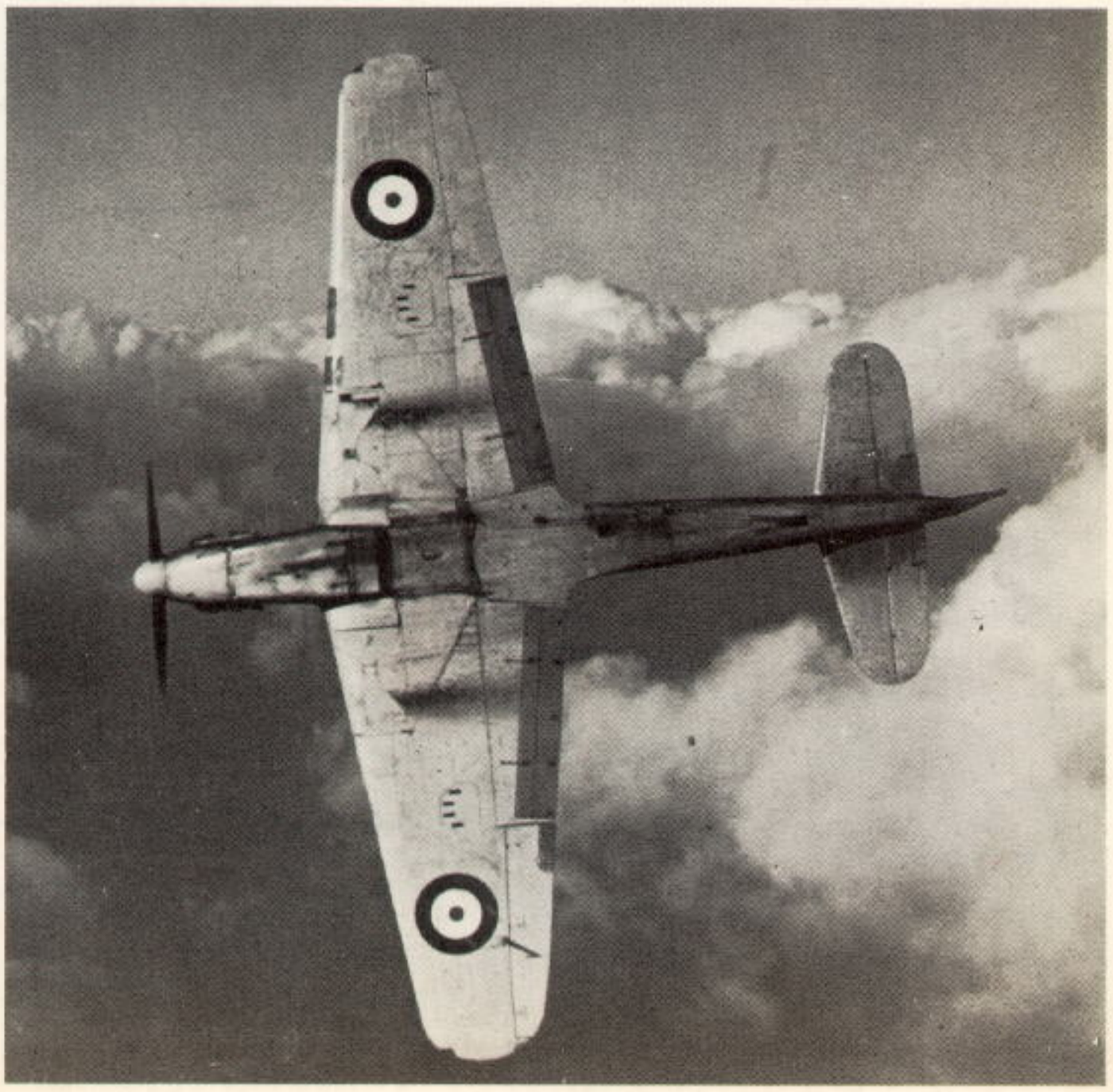
254

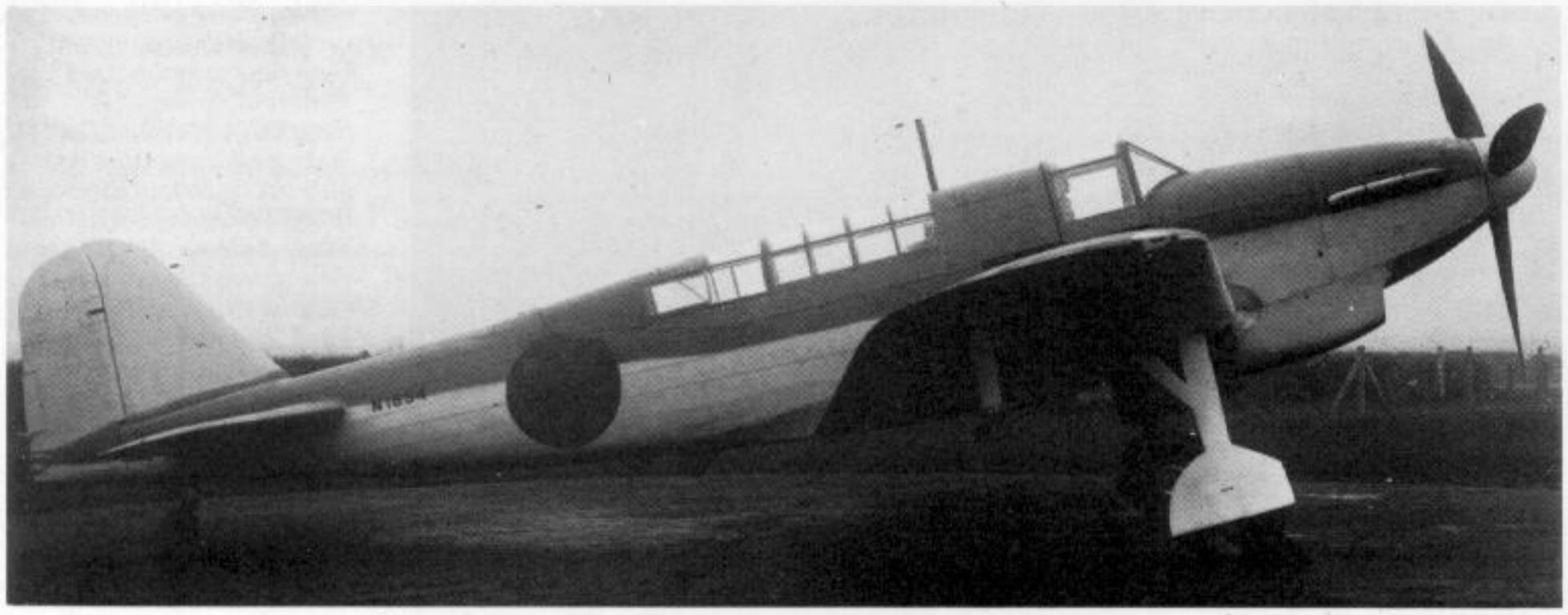
Fairey Fulmar Mks I & II

by David Brown

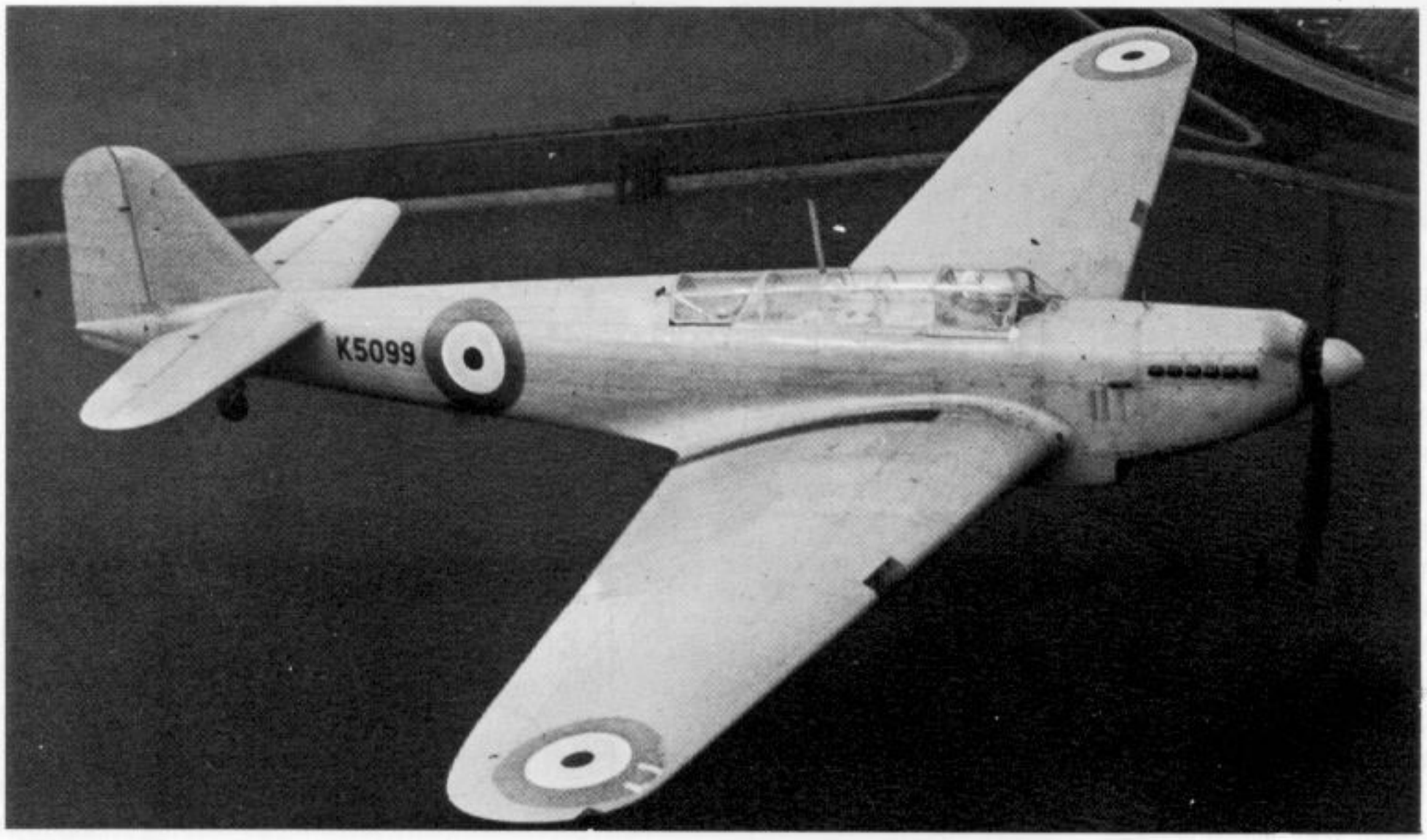
40p/$2.00







Prototypes: First Fulmar (N1854) at A&AEE in December 1939. Apart from R-R Merlin III (production Mk.I: Merlin VIII), N1854 has separate fairing panels over main oleo leg and bracing strut, protruding flare chute below Observer's cockpit and no armoured windscreen or gunsight – with the associated raised forward coaming. Compare with the air-to-air view of the first prototype P.4/34 (K5099) which was photographed in November 1937.
(Photos: Imperial War Museum, ref. MH5182 and *Flight International, ref. 14100-srs.)*



Fairey Fulmar Mks I & II

by David Brown

'Any old iron, any old iron,
Any, any, any old iron;
Talk about a treat,
Chasing round the Fleet
Any old Eyetie or Hun you meet!

Weighs six ton,
No rear gun,
Dam' all to rely on!

You know what you can do
With your Fulmar Two;
Old iron, old iron!'

(Believed to have originated in HMS Victorious, *and inspired by Harry Champion's evergreen music hall song)*

In the space of two years between September 2 1940 and August 12 1942, the Fairey Fulmar destroyed no fewer than 112 enemy aircraft in air combat and damaged over 80 more. In retrospect, since this total amounted to nearly 30 per cent of the Royal Navy's tally of victories, this represents a considerable success for a naval fighter which was an emergency make-shift—designed and produced as it was in extreme haste.

Fleet Fighter Requirement

Towards the end of 1937, the Fleet Air Arm's fighter procurement programme appeared to be in serious trouble. Development difficulties with the new types ordered from Blackburn Aircraft Ltd of Brough, East Yorkshire—the Skua two-seat fighter/dive-bomber and its multi-gun (4 × 0.303-inch) turret-equipped Fleet fighter development, the Roc—made it obvious that the first of the 190 Skuas and 136 Rocs ordered could not be in service by the end of 1938.

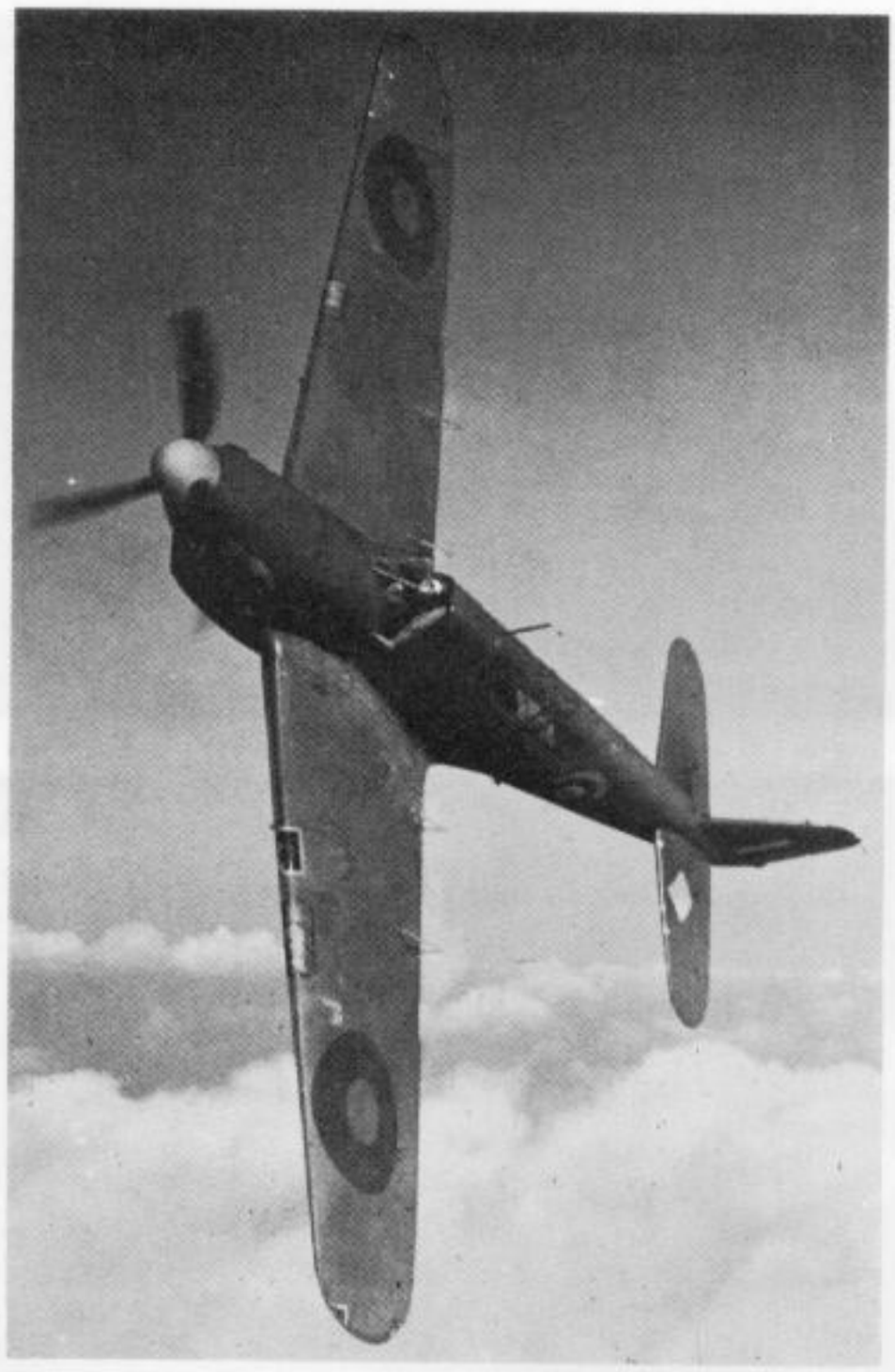
Indeed, it appeared that both might fail completely and that an alternative Fleet fighter would have to be sought.

The requirements of the Royal Navy for the Fleet fighter—to be embarked in the new armoured aircraft carriers—could not be met by any existing fighter designs of the Royal Air Force (RAF). Essentially, these requirements were for fighters capable of escorting torpedo striking forces and of driving-off enemy Fleet shadowers and reconnaissance aircraft. At that time, radar for warships was in its early stages and the Fleet could not rely on naval fighters for defence against air attack since effective long-range air-raid warning was impossible. The defence would be left to the guns of the ships. In any case, the Fleet was not expecting to be called upon to operate within range of modern bombing forces; the RAF had claimed it could deal with enemy naval forces in coastal waters and narrow seas.

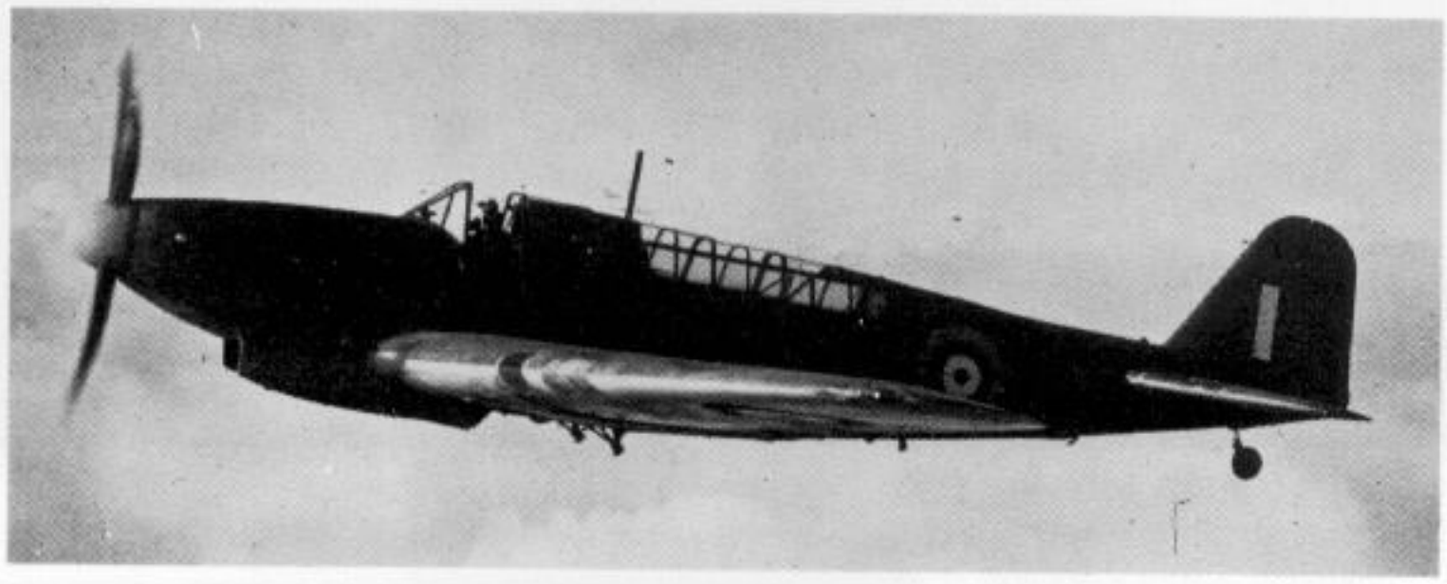
Accepting the premise that land-based fighters were not likely opponents—and, therefore, that the Fleet fighter would not require extremes of manoeuvrability and performance—the Royal Navy insisted on the provision of a second seat for an Observer or a Telegraphist Air-Gunner (TAG). Navigational equipment would obviously be a necessity for the rear seat, but the General Purpose Wireless Telegraphy (W/T) set was its real *raison d'etre,* so that the fighter could maintain contact with the ship and with the strike aircraft with which it would operate. The pilot would have a High-Frequency (H/F) Radio-Telephone (R/T) set. The range of the voice radio was considerably less than that of the morse set.

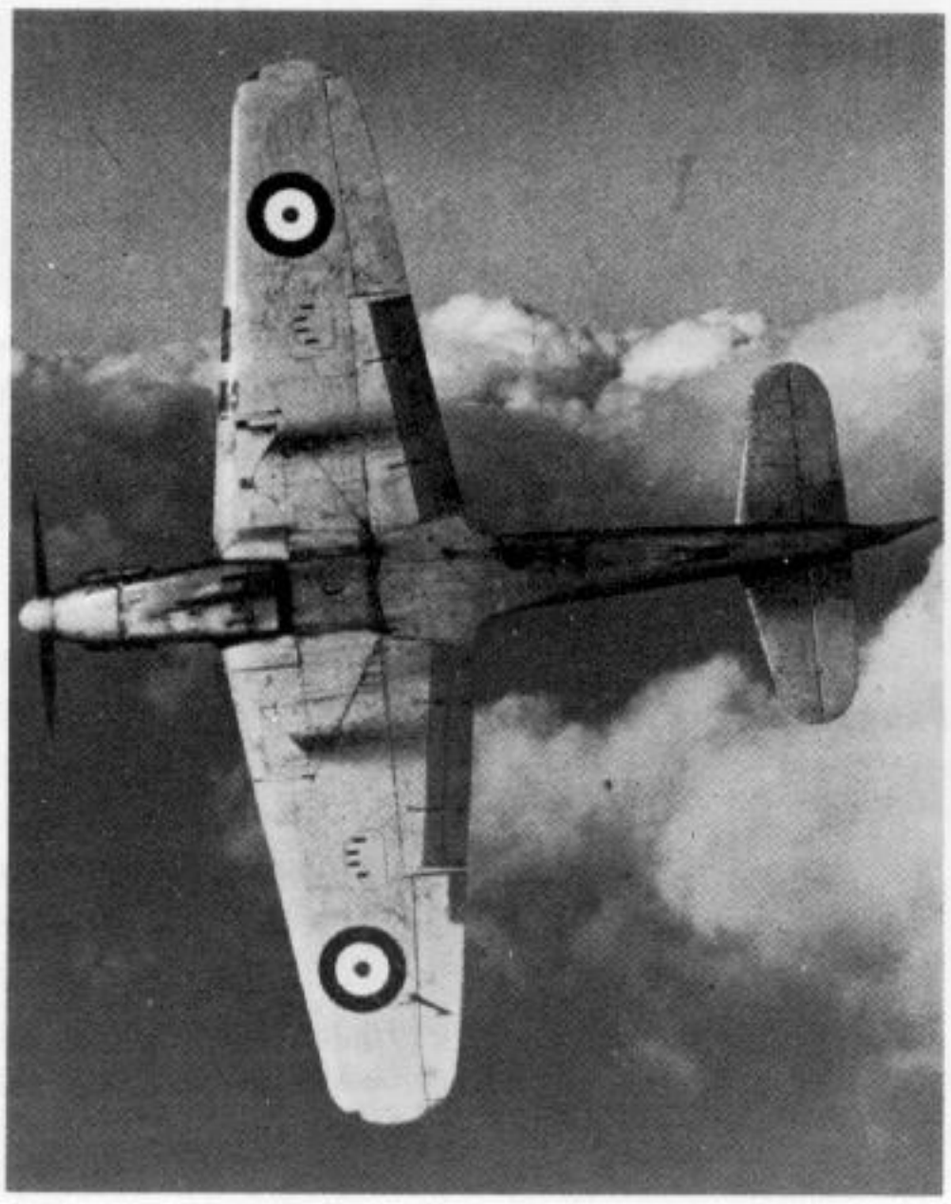
As well as the second seat, the naval fighter was to differ from its RAF counterpart in its provision for great endurance. The Skua specification called for fuel for three hours flying at cruising speed and 30 minutes of combat, whereas the land-based interceptors were to be capable of only an hour's loitering and 15 minutes of combat. The true long-range fighter —the *Luftwaffe's Zerstörer* (or 'destroyer', the Messerschmitt Bf 110)[1]—was completely missing from the RAF's inventory: and the Admiralty would have to find its Skua alternative/replacement from a less obvious source.

By a fortunate chance, such a source, or at least a basis for development, was at hand. The RAF had issued a Specification (P.4/34) for a high-speed light bomber to complement the Fairey Battle light bomber and had ordered prototypes from the Fairey Aviation Company and from Hawker Aircraft. The requirement was cancelled before the first Fairey P.4/34 or Hawker Henley had flown, but the two aircraft met the Specification handsomely, with maximum level speeds in excess of 280 m.p.h. and an endurance of four hours. With a modern front-gun arma-



Fifth and final 'pre-production prototype' (N1858) in 1940 (Top view sensitive paint 'diamond' (poison gas detector) on tailplane) and in underside view, the two gun-bays with four cartridge (0.303-in) chutes, each inboard of roundels. The side view reveals the two sets of catapult spools and arrester hook. This aircraft is fitted with four brackets on the wing trailing-edge connected with a trials installation of a typical Fairey-Youngman cruise/dive-brake flap – deleted by censor.
(Photos *Flight International,* ref. 18000-srs.)





[1] See Profile No. 207: Bf 110 (Day Fighters).

ment and the necessary modifications for carrier operations, one or other of the two monoplane two-seaters would make an admirable Fleet fighter.

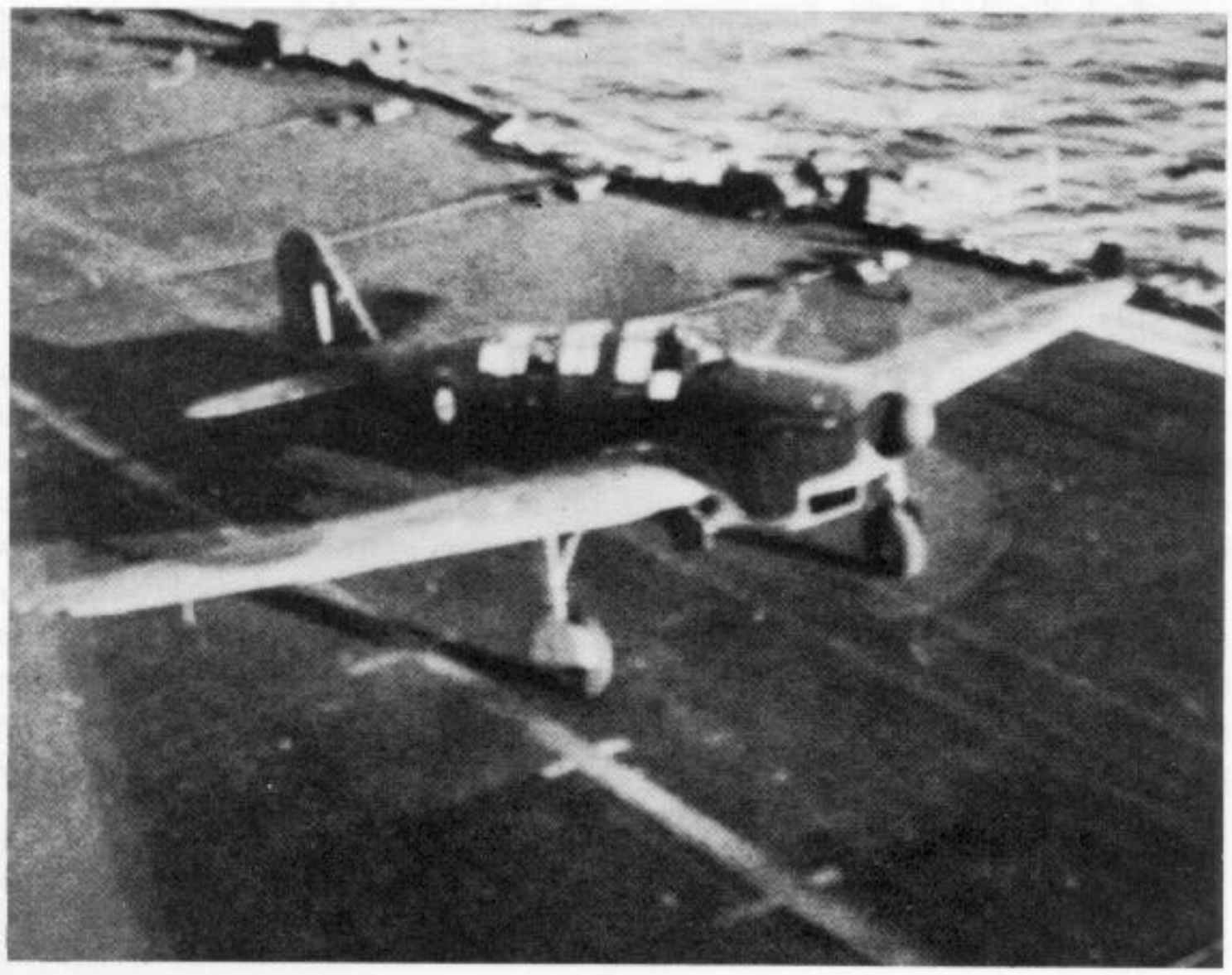
By the end of November 1937, when the first conference discussed the selection of the new naval fighter, a third type had been added to the list of possible choices. The Philips and Powis (Miles) M.9 Kestrel had been designed as a Private Venture to meet the demand for an advanced fighter trainer. That the RAF had no such demand and did not admit the necessity for such an aircraft until 1938 had not deterred Mr Fred G. Miles, who had designed the compact M.9 lightweight trainer with a maximum speed of 296 m.p.h. and a rate of climb equal to that of the Hawker Hurricane interceptor. To suit it for naval fighter duties, however, the Kestrel needed the load-carrying capacity for fuel to extend its endurance and to instal the requisite armament and operational equipment. Also, the M.9's Rolls-Royce Kestrel engine had reached the limit of its development potential, whereas the Merlin (installed in the Fairey and Hawker aircraft) had barely begun its very long life. The Miles trainer was therefore considered no further by the Royal Navy—later developed for its original role it became the Master.

The merits of the Fairey P.4/34 and the Henley were compared during December 1937 and early January 1938, and on January 13 the Air Ministry recommended that the Fairey aircraft should form the basis of the design for the naval fighter. Hawker production facilities were already committed to Hurricane production and the design staff was developing the Tornado fighter and would have little capacity for the major fuselage redesign needed to suit the Henley for the naval fighter role. Fairey was about to be issued with the Specification for the Barracuda[1] torpedo-bomber and was struggling with the Albacore design, but the P.4/34 was a basically successful aircraft, on which only detail design work would be necessary to suit it for its new role, as demanded by the Specification.

Specification 0.8/38

The Naval Staff Requirements were forwarded to the Air Ministry a week after the decision was taken to proceed with the Fairey aircraft. The basic requirements were those stated above, but the endurance was to be increased to six hours on patrol at 138 m.p.h. or three hours at 175 m.p.h. for escort duties. The maximum level speed was to be 265 m.p.h. at 10,000 feet, with a stalling speed of not more than 65 m.p.h.

Following the pattern of RAF fighter armament, an eight-gun fixed forward battery was demanded, 0.303-inch Brownings with at least 400 rounds per gun. Unlike the P.4/34 bomber, which had been built with a mounting for a free 0.303-inch Lewis machine-gun in the rear cockpit, the fighter would carry no rear armament—an omission to be much regretted by the crews of the aircraft. Shallow dive-bombing was to be a secondary role, with provision for the carriage of two 250-lb bombs, one under each mainplane.



One of the few photographs of an 806 Squadron Fulmar aboard Illustrious *in 1940.* (Photo: via C. F. Shores)

In common with other naval aircraft of the period, the fighter was to be designed to operate on floats as well as a landplane, the conversion to take not more than four men just two hours to effect. The maximum all-up-weight (auw) as a floatplane—the heaviest permissible condition—was not to exceed 8,500 lb—an unduly optimistic demand when it is considered that the P.4/34's auw was only 8,878 lb in the first place and the fighter's armament alone would represent an increase of over 350 lb. The fighter would also need to be strengthened for arrested deck landings and a hook installed, and it would need to be stressed for catapulting ('accelerating' from a trolley.

The major dimensional restriction was that of a maximum wingspan of 46 feet—16 inches less than that of the P.4/34—which was to fold to 18 feet or less. The folding and spreading of the mainplanes was to be carried out in wind speeds of up to 30 knots by only four men.

The draft Specification was issued on February 11 1938 after discussions between the Air Ministry and the Admiralty—with the weight restriction relaxed. The latter's insistence on an engine with a 100-octane rating—to bring it into line with the Barracuda Specification—was accepted, but the preference for an air-cooled engine could not be obliged, and a moderately-supercharged Rolls-Royce Merlin 'H' was specified. Fairey had wished to fit their own constant-speed propeller, but this was regarded as being too experimental for an aircraft which was required urgently and a Rotol variable pitch unit was

[1] See Profile No. 240: Barracuda Mks I-V.

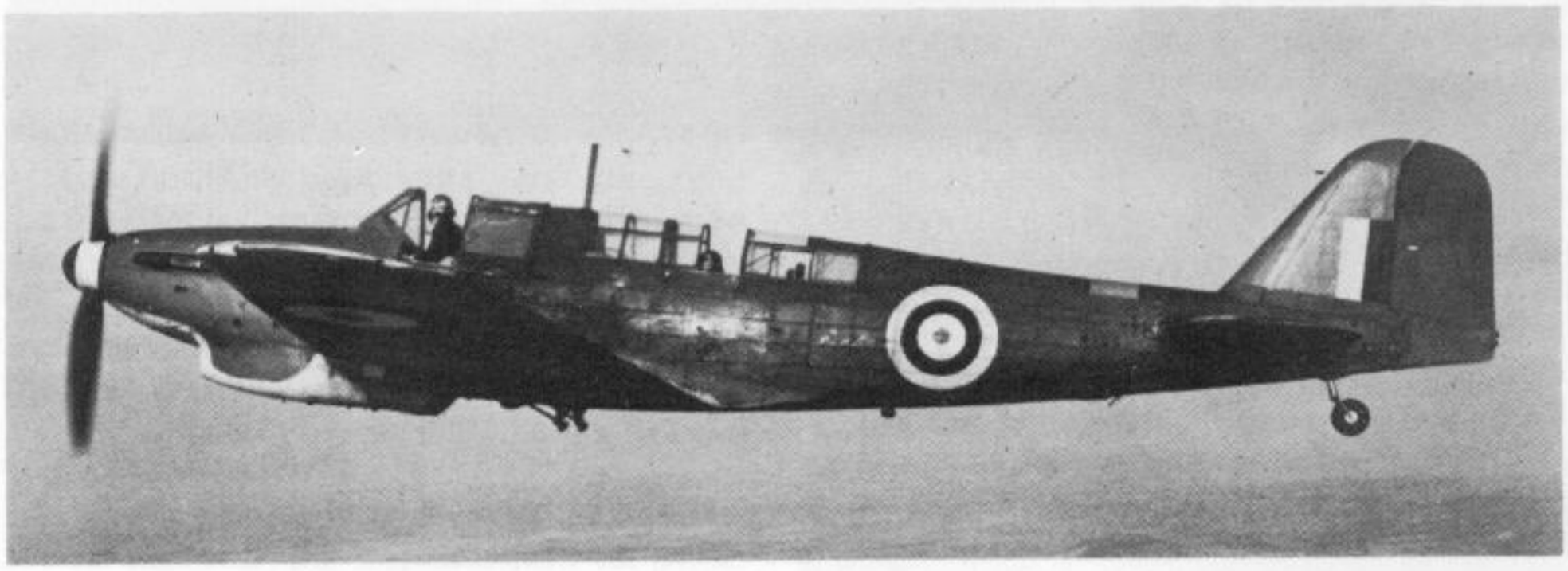
specified. Similarly, the Fairey gun installation was not accepted and the Henley's layout—basically that of the Hurricane—was to be employed, with at least 500 (and if possible 600) rounds per gun.

The enclosed cockpits of the P.4/34 were to be retained, the Observer's being given the best possible view aft and on either beam, with the facility for taking compass bearings even if this involved a contorted position away from the rear seat. The pilot's seat was to be raised by five inches, with a corresponding alteration to the height of the cockpit canopy, to improve the view for fighting and deck-landing. The only major aerodynamic alteration was to be a four-degree increase in wing incidence. This complemented the raising of the pilot's seat by giving the aircraft a more nose-down attitude which not only improved the forward view but also made gun and sight alignment simpler.

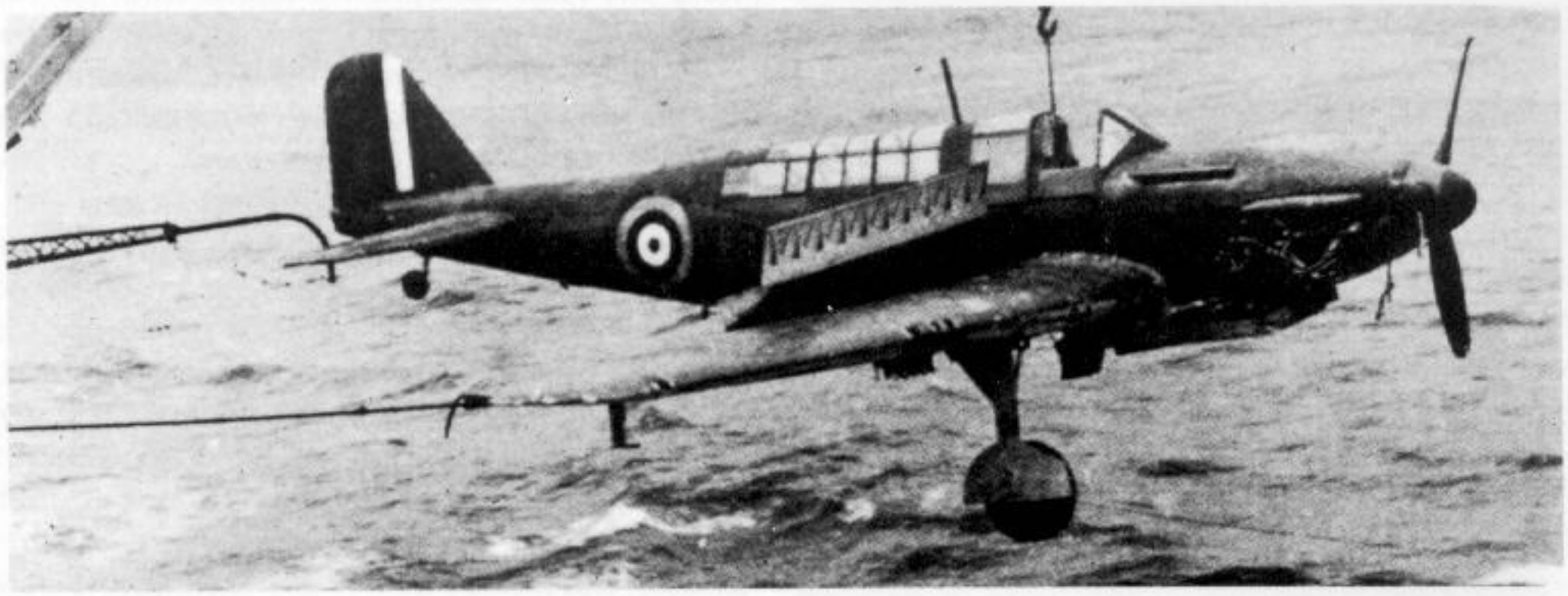
The first aircraft was to be delivered in September 1939 and a minimum of eight were to be produced each month until the order was fulfilled.

Development

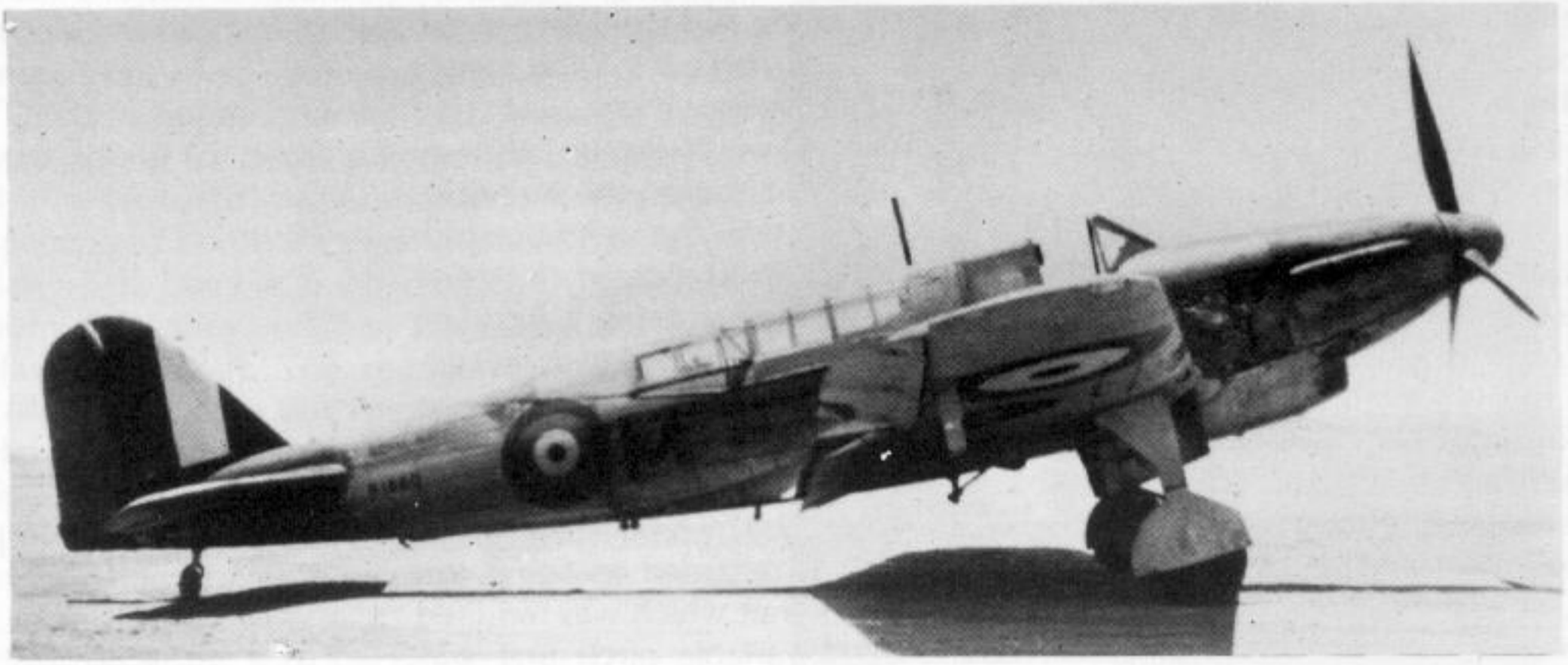
Fairey Aviation was informed of the details of the Specification on March 16 1938. By May 5 the firm had been able to assure the Admiralty that the modified P.4/34 would be able to meet the specification requirements and an order had been placed for 127 Fleet fighters, to be known as the 'Fulmar'. No separate prototype contract was issued as the second P.4/34 prototype, K7555, would be used as the development airframe. The design was 'frozen' at the end of



The 99th Fulmar (N1952) seen while serving with 807 Squadron during the early part of 1941. In 1943, and up to September 7 1944, N1952 was on the strength of 778 Squadron as part of the flight allocated to the trials carrier Pretoria Castle. *Built in November 1940; it was 'reduced to produce' in September 1944.*
(Photo: Charles E. Brown)



Every picture tells a story: An 808 Squadron Fulmar is suspended over the side by Ark Royal's *crane, steadied by lines attached to wing tip and port wheel. The aircraft has been engaged by the barrier—hence the considerable damage to the underside of the engine cowling and radiator—and has been hoisted outboard to clear the landing area for other aircraft. Note that the flaps have not been closed before the trailing edge has been raised for folding.*
(Photo: via C. F. Shores)



A rare photograph of a Fulmar I of 805 Squadron, at RNAS Dekheila, Egypt, early in 1941.
(Photo: B. Rigelsford)

May 1938 with the issue of the production Specification.

Marcel J. O. Lobelle, who had designed the P.4/34, was now engaged in the design of the Barracuda, for which a prototype order was imminent, and with the Albacore prototype approaching completion there is little doubt that the Fairey design organization was over-extended and that production would have to be carefully 'dove-tailed' if the required in-service dates were to be met.

The Munich Crisis in September 1938 led to an increase in the size of the Fulmar order, to 250 aircraft. At the same time, Fairey informed the Admiralty that production would not commence before March 1940, when the Stockport (Heaton Chapel) factory would be completed and tooled-up. The rate of production would build up to 25 aircraft per month, so that Barracuda production, which was to follow, would be able to start in 1941 as scheduled.

(The immediate effect of the delay was an emergency order for 60 Gloster Sea Gladiators for delivery in the spring of 1939 and the loan of 38 unmodified Gladiators from the RAF. Fitted with arrester hooks, 22 of these 'Crisis Gladiators' were not returned and gave sterling service in defence of Scapa Flow and the Home Fleet off Norway during the spring of 1940.)[1]

Meanwhile, K7555 was modified to incorporate the aerodynamic alterations demanded by Specification 0.8/38. During 1939 the Merlin VIII (the 'H' redesignated once its production status had been confirmed) was installed and the P.4/34 became an 'advanced replica' of the production Fulmar.

The First Fulmar

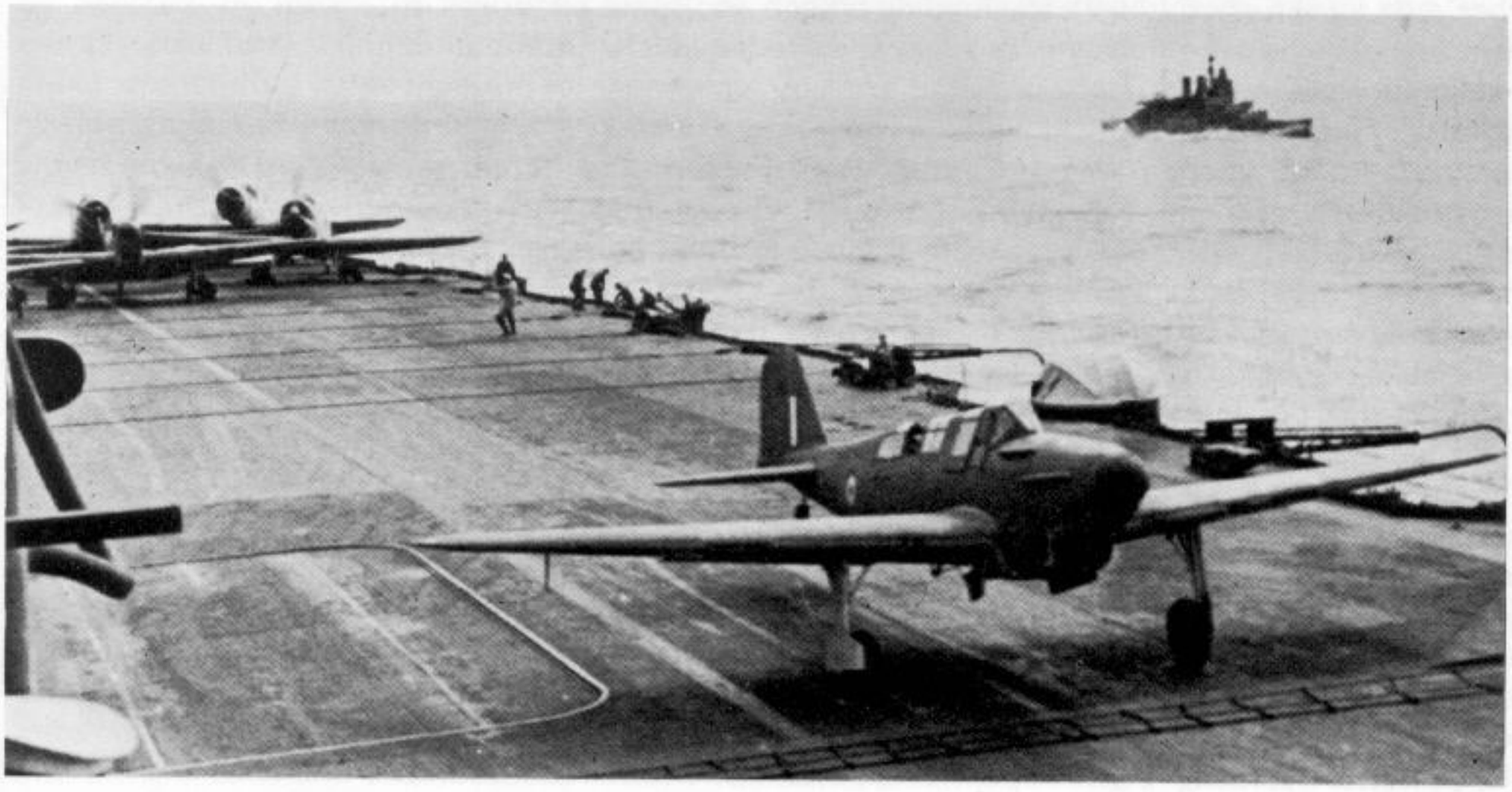
Two of the first five aircraft could fairly be described as 'pre-production prototypes'. The initial prototype (N1854) made its first flight from the Ringway airfield, to which it had been transferred by road from Stockport on January 4, 1940. This aircraft (and N1858, which did not fly until May 1940) was fitted with a Rolls-Royce RM3M engine—a modified Merlin III with a supercharger which gave maximum power at 7,500 feet—but all the other Fulmar Mark Is featured the intended Merlin VIII. Originally two (N1856 and N1857) were intended to have been completed as float-planes, but this requirement was cancelled in the opening months of 1940 and both appeared as land-planes.

The first aircraft (N1854) attained speeds of 255 m.p.h. at 2,500 feet, and approximately 245 m.p.h. at 9,000 feet, but N1855, with only 25 h.p. less, was appreciably slower at low level—about 235 m.p.h.— but appreciably faster at 7,500 feet. In service, the 265 m.p.h. was reduced by over 10 m.p.h. and the performance details given in the data summaries are for the Fulmar in squadron service. A relatively low rate of climb had been anticipated, but as the all-up-weight had risen to over 10,000 lb, so the best rate of climb deteriorated to a mere 1,200 feet per minute—far below what was expected of a modern fighter.

Endurance fell an hour short of the demanded six hours, although it was still double that of any contemporary Western single-engined fighter. The ammunition capacity exceeded the 'if possible' requirement, the 750 rounds per gun being twice the capacity of either the Hurricane or Spitfire.

The protected 155-(Imperial) gallon main fuel tank separated the two spacious cockpits, but the only other crew protection was the pilot's bullet-proof windscreen. The pilot's forward view, and the view downwards over the leading-edge of the mainplane, were better than in any other modern single-engined fighter. The rear cockpit was equipped with a chartboard position forward and the T1115/R1116 W/T set aft, the seat rotating to alternative fore and aft positions. Intercommunication was effected either by speaking tube or by making use of the 'sidetone'

[1] See Profile No. 98: Gladiator Mks I & II (& Sea Gladiator).



'7-C' of 808 Squadron lifts its tail wheel as it takes off from Ark Royal *during Mediterranean operations in February 1941. The aircraft is about to cross the safety barrier. In the background is the battlecruiser* Renown *and ranged aft for take-off are another Fulmar and Skuas of 800 Squadron.*
(Photo: IWM, ref. A3735)

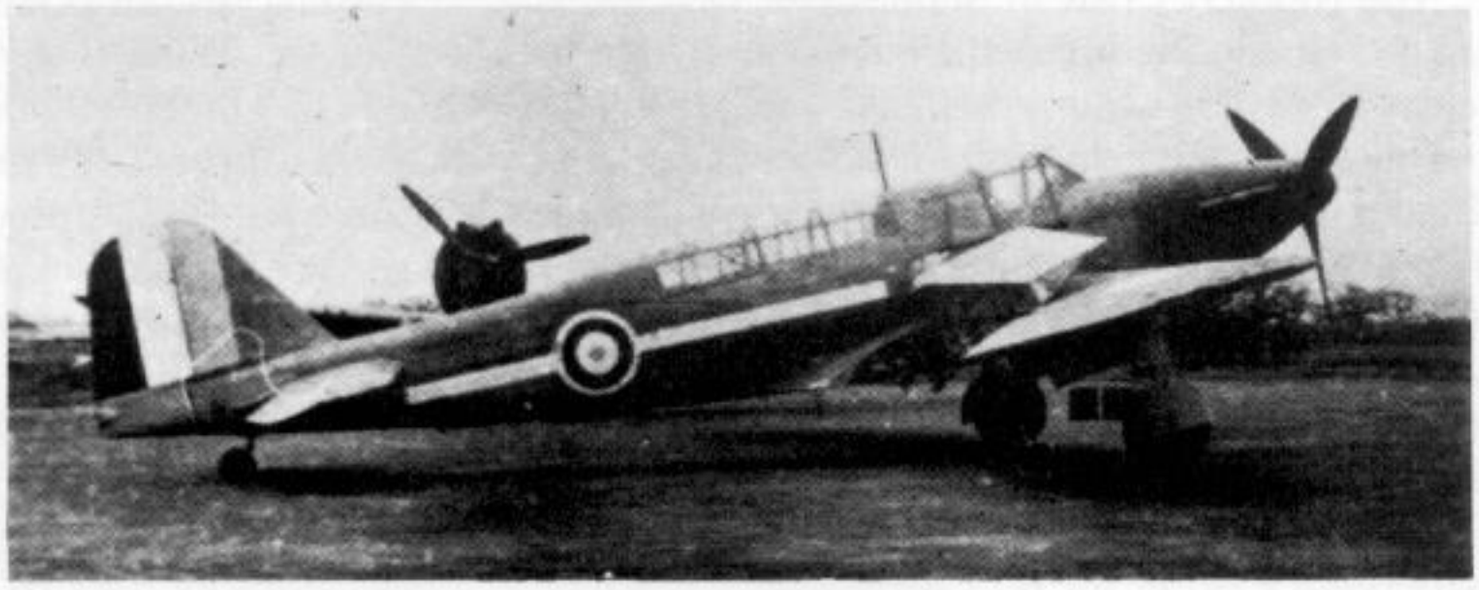
of the pilot's TR9D H/F R/T set. The high noise level in both cockpits made the former method almost unusable. A shared radio facility was the R1147 homing beacon receiver.

The first Fulmar with the Merlin VIII (N1855), flew on April 6 1940 and after manufacturer's trials was passed to the Aeroplane & Armament Experimental Establishment (A&AEE) at Boscombe Down (Wiltshire) for Ministry of Aircraft Production trials, on May 3. The Ministry pilots passed generally favourable comments on the Fulmar. It had no vices and was pleasant to fly, manoeuvrable at all speeds attainable in level flight, with light, responsive controls. In service, with full equipment, the Fulmar became only marginally stable longitudinally, particularly at low airspeeds, due to the centre-of-gravity being well aft. With the large-area Youngman flaps lowered and the engine throttled back, the elevator and rudder controls became less responsive due to the change of airflow pattern, but there were no significant changes of trim when the flaps, undercarriage, or radiator flap were operated.

The criticisms were, of course, mainly directed at the performance. Top speed, rate of climb, and ceiling were all low for a fighter. At maximum weight, N1855's ceiling was only 19,800 feet. In front-line service, with full equipment and a 'used' engine, this fell to little more than 16,000 feet. However, because it had a very high 'density'—weight relative to volume—the Fulmar had a high diving speed, which built up more quickly than was usual with lightly-built European fighters. In spite of increased handling loads, the fast dive made up considerably for the lack of knots in level flight.

N1856 was delivered to the Service Trials Unit (STU) (778 Squadron) at Royal Naval Air Station Lee-on-Solent on May 10 1940. Carrier-type take-offs and landings were simulated on a dummy flight deck marked on the runway, and on June 3 N1856 was flown to the brand-new carrier HMS *Illustrious* for initial deck trials. The ship was in the midst of her own very rushed trials—on passage between degaussing in the Clyde and direction-finder calibration at Devonport—and the flying trials were very brief. A pilot from the STU and another from A&AEE each carried out two landings and take-offs, sharing the deck with an Albacore and a Swordfish. The Fulmar proved to be very easy to deck-land, view and control being excellent, but take-off was accompanied by appreciable crabbing to port, caused by propeller torque and, possibly, the effects of the disturbed airflow over the deck abreast the carrier's island. Apart from this disconcerting phenomenon, which was partially cured by the fitting of a lockable tailwheel, take-off was straightforward and the aircraft became airborne after a 280-foot run in 20 knots of wind. The wide-track undercarriage gave a very great degree of stability when taxiing on the deck, and the powerful hydraulic brakes were much appreciated.

An Ark Royal Fulmar misses the arrester wires and swings to port in executing a 'round again' of which neither the landing signals officer (running clear) nor Commander (F) would have approved.
(Photo: IWM, ref. ZZZ53170)



Before 807 Squadron joined Ark Royal at the beginning of April 1941, the squadron proceeded to Freetown with Furious. On March 27, while carrying out a local reconnaissance sortie from the ship this Fulmar force-landed in Vichy French Senegal. Recovered by the French, it was restored to flying condition and 'adopted' by Groupe de Chasse I/4, based at Dakar, one of whose Curtiss Hawk 75As can be seen behind the Fulmar—believed to be the only aircraft of its type to fly in foreign service.
(Photo: Archives Dr Riviere, via C-J. Ehrengardt)

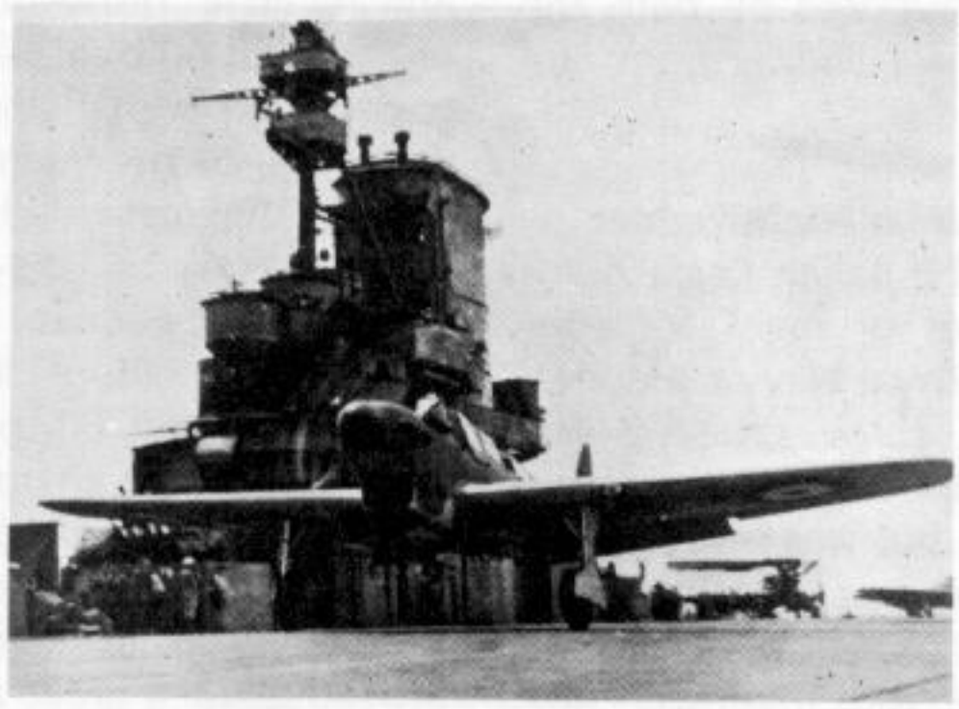
The wingfold arrangement was almost identical to that of the Barracuda. The mainplane folded aft about a pivot at the rear spar connection, and to provide a cut-out to allow the wing to swing aft, the flap and 'fixed' portion of the inboard trailing edge was folded upwards and forward over the mainplane. As in the later Barracuda, this was achieved by means of the flap hydraulic system, but was controlled from the rear cockpit and had a safety interlock which prevented pressure from being supplied until the engine fuel cock in the pilot's cockpit was turned off. The mainplanes were locked by a latch which extended for nearly the entire depth of the wing at the forward spar.

Integral engine starting systems, to eliminate the need for external support, have always been a desirable feature for naval aircraft. The Fulmar was one of the first service aircraft to incorporate the Coffman cartridge starting system which, with the loading breech and spare cartridges in the pilot's cockpit, reduced the number of personnel and ancillary equipment on the flight deck.

The Fulmar was stressed and fitted for 'accelerated' take-off. On a carrier, the aircraft was raised to a flying attitude by a collapsible trolley which held the tail up but allowed the aircraft to run on its own main wheels. The trolley was then towed down the flight deck by the catapult mechanism and the aircraft flown off in a mere 60 feet. The 'spools'—strengthened attachment points for the four arms of the trolley—consisted of two pairs of spigots, the after pair being just abaft the wing-root fillet and the forward pair under the fuselage/wing centre-section, held away from the under surfaces by triangular struts which projected some six inches into the airflow. The spools and struts were permanent fittings which contributed

significantly to the aircraft's parasitic drag—to the extent of up to 10 m.p.h. at maximum speed.

The arrester hook was a simple unfaired 'V' frame, hinged to the fuselage lower longerons in the vicinity of the aft catapult spool strengthening and held up in channels by a simple snap gear which was released by a Bowden cable controlled by the pilot. When retracted, only the bill of the hook projected below the fuselage into the airstream; when extended, the frame was damped hydraulically, to prevent the hook from skipping over the wires and to maintain it in contact with the deck.



On arrival aboard Ark, 807 took the place of 800 Squadron's Blackburn Skuas and adopted the prefix '7' previously carried by 808 Squadron. Here, an 807 Fulmar takes off in slightly humid conditions, leaving propeller tip vortices.
(Photo: P. J. Spelling)

Production—Fulmar Mks I and II

The Merlin VIII-powered Fulmars had begun with N1855 in April 1940; another six followed in May, then 12 in June and another 20 in July. During August, Fairey's Stockport factory produced the 25 aircraft which they had promised as the maximum rate—only two and a half years after they had received the original details of the Specification. In September 1940, the numbers fell off to 20 aircraft as the Admiralty fought to keep its aircraft among the list of types for priority production. But, in October and November, Fairey exceeded their 1938 promise, by producing 27 and 29 Fulmars respectively. By the end of the year, 159 of the much-needed fighters had been delivered to the Royal Navy and were in service with four front-line squadrons.

Even as the first unit—806 Squadron—worked-up, Fairey had submitted plans for the Fulmar Mark II. The new Mark was to be fitted with the 1,260 h.p. Merlin 30, already intended for the Barracuda I, and designed to give maximum power for take-off and at 7,250 feet. The selection of a common engine for the Royal Navy's standard fighter and torpedo-bomber would make spares procurement and spares stowage a simpler process, as well as simplifying groundcrew on-type training.

At the same time, weight reductions were to be effected, by means of the replacement of certain structural components by others of equal strength but lighter weight. At maximum all-up-weight this involved a saving of 350 lb, which enabled the designed bomb-load of 500 lb to be carried when operating from the carrier.

The first Mark II Fulmar (N4021) was the 155th aircraft off the production line. Completed during the last week of 1940, it did not fly until January 20 1941; but again, Fairey's Stockport factory was able to start production immediately by converting standard Fulmar I airframes on the line. The lowest-numbered Fulmar 'I/II' known to have joined a front-line unit during the first quarter of 1941 was N4028. It was allocated to 804 Squadron on March 10, and it is fairly certain that all aircraft from N4060 onwards were completed with the Merlin 30. These aircraft were *not* built with the additional cheek intakes with integral sand and dust (tropical) filters, but

Ark Royal *launches Fulmars during Operation 'Tiger'—a strongly opposed convoy operation which delivered over 200 much-needed tanks to the 8th Army in May 1941.*
(Photo: C. J. Wood)

800 Squadron re-equipped with Fulmars from May 1941, but owing to the needs of other squadrons at this time, its original Mark IIs were soon replaced by Mk. Is, such as N1875 'H' and N1910 'L', which had both served with 807 and 787 Squadrons prior to joining 800.
(Photo: G. Wallace)

the radiator 'bath' was slightly wider and the intake was of greater frontal area.

In the autumn of 1940, orders were placed for 200 Fulmar IIs (beginning with X8525) and then for 50 and 100 aircraft (in the BP and DR serial ranges). The 600th Fulmar (DR749) and the 425th (at least) Mark II, flew in February 1943, being completed as a night-fighter.

The Fulmar II did not show a great advance in performance over the Mark I, although the slightly better level speed was attainable over a wider height band. From 3,000 feet to 13,000 feet, the Fulmar II bettered 250 m.p.h., achieving its maximum of 260 m.p.h. at 9,000 feet. The rate of climb showed a substantial improvement, due in almost equal parts to the reduced weight and extra power. Instead of taking 15 minutes to labour to 15,000 feet, the aircraft now took only 12 minutes, climbing at a steeper angle. The service ceiling remained in the region of 16,000 feet—sufficient to break up dive-bomber formations before they could deploy for the attack, but not enough to catch the high-level

reconnaissance aircraft favoured by both the *Regia Aeronautica* and the *Luftwaffe* from late 1941.

Radio and Radar—the Fulmar Night-Fighter

In the autumn of 1940, the Italian *Regia Aeronautica* delivered a series of night torpedo-bomber attacks on the Royal Navy's Mediterranean Fleet, damaging three cruisers. The Fleet had one radar-equipped carrier and the first squadron of Fulmars, but was incapable of providing any night air defence. In United Kingdom Home Waters, the problem was not so much darkness as weather, with shadowers able to take refuge from the fighters in cloud. No night-fighter was available—even the RAF's radar-equipped night-fighter force was in its infancy—and the Admiralty decided to adapt the Fulmar as an interim night-fighter. The two-seat layout and the ample space in the rear cockpit made the Fulmar an ideal vehicle, while its great endurance compensated for its low speed, which was of less consequence for this form of aerial tactics.

An Air Interception radar Mark VI (AI VI), similar to the set installed in the Boulton Paul Defiant NF II[1], was obtained from the RAF and was installed in a Fulmar II at Lee-on-Solent by the Naval Air Radio Installation Unit. The radar failed to perform as well as had been hoped, particularly at low-level, where the main task of the naval night-fighter would lie, and early in 1942 the AI VI was replaced by a modified version of the earlier AI IV. Three antenna masts, each with a *yagi*[2] transmitter/receiver array, were installed on each mainplane, height discrimination being obtained by the comparison of the signals received by the outboard arrays—one above and one below the mainplane, and bearing discrimination deriving from the compared signals received by the inboard arrays on the upper surface of the mainplanes.

The added drag of the six masts and arrays led to a 15–20 m.p.h. drop in performance, and the detection range on another aircraft of similar size was less than three miles at 5,000 feet. The Fulmar night-fighter was not issued to a front-line unit until the end of February 1944, although some aircraft were held in the front-line reserve from the late autumn of 1942.

Although the Fulmar was unsuitable for the night interception of modern shadowers, it was used for the training of naval night-fighter crews from June 1942, when 784 Squadron was formed at Lee, and it was used for the development of the Fairey Firefly NF II. A pre-production centimetric AI X was installed in a Fulmar NF during the spring of 1943, separate transmitter and receiver 'dishes' being fitted in a radome under each outboard mainplane. Matching the transmitted signal and the reflected 'return' proved to be the main difficulty with this scanner arrangement, which eventually proved unsatisfactory in the Firefly as well as the development Fulmar.

Altogether about 100 Fulmar night-fighters were converted, 50 to a training standard and the remainder to an operational standard with a more effective forward-firing armament.

In April 1942, a new lightweight H/F W/T set was fitted to front-line Fulmars. The TR1161 proved to be a great advance over the old GP set in almost every way, particularly in respect of its ease of operation. Fulmars were now being used as long-range reconnaissance aircraft in the Indian Ocean, and Observers who had been accustomed to the luxury of a Telegraphist to operate the W/T while they navigated and observed were thus not over-burdened with the addition of the communications task.

Armament and External Stores

The eight-gun battery of 0.303-inch machine-guns remained the standard armament of the day-fighter Fulmar throughout the aircraft's useful operational life. Barely adequate against lightly-built Italian aircraft, it was totally inadequate against German bombers and maritime patrol aircraft, even when the squadrons were provided with De Wilde and B VI Z incendiary ammunition.

Ammunition capacity went up from 750 to 1,000 rounds per gun—three times the Hurricane's ammunition load—but this did not increase the chances of destroying a really tough enemy like the Blohm und Voss BV 138 (three Fulmars of 809 Squadron expended 18,000 rounds on a BV 138 without inflicting any obvious damage) or of inflicting lethal damage during the one pass that was possible against faster aircraft such as the Ju 88.

The installation of a 20-mm cannon armament was apparently not considered, but during the summer of 1941 four 0.50-inch heavy machine-guns were fitted to a Fulmar. Evaluation was undertaken by the STU and the NAFDU (Naval Air Fighting Development Unit—787 Squadron). The installation was satisfactory, and the better armour-piercing qualities of the 0.50-inch resulted in a recommendation that as many aircraft as possible should be rearmed. Unfortunately, there was a shortage of the guns and priority was given to the arming of the night-fighter Fulmars, their tactics necessitating an approach from astern, where the target's armour would be thickest. The last 100 Fulmars to be built (the DR serial range) were fitted for, but not all with, the 0.50-inch gun, which had an ammunition stowage capacity for 370 rounds per gun.

The rear cockpit occupants, TAGs (Telegraphist/Air Gunners) and Observers very soon

Key to colour side views

1 *Prototype Fairey Fulmar (serial N1854) under test at the Aeroplane & Armament Experimental Establishment, Boscombe Down (Wiltshire) in April 1940.*

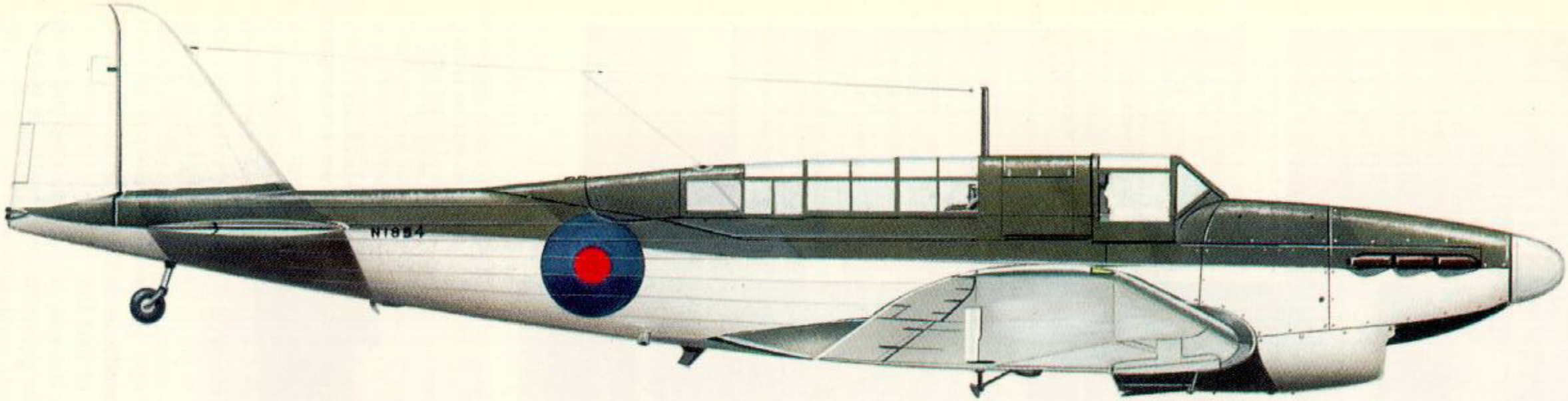
2 *The same N1854 after progressive wartime updating and finally, in 1946 at Fairey's Ringway (Manchester) factory, civilianized as G-AIBE (C of A February 26 1947).*

3 *Fulmar II (BP782) with belly tank and 40-lb G.P. bomb on wing rack; 806 Squadron aboard HMS* Illustrious, *Indian Ocean in 1942.*

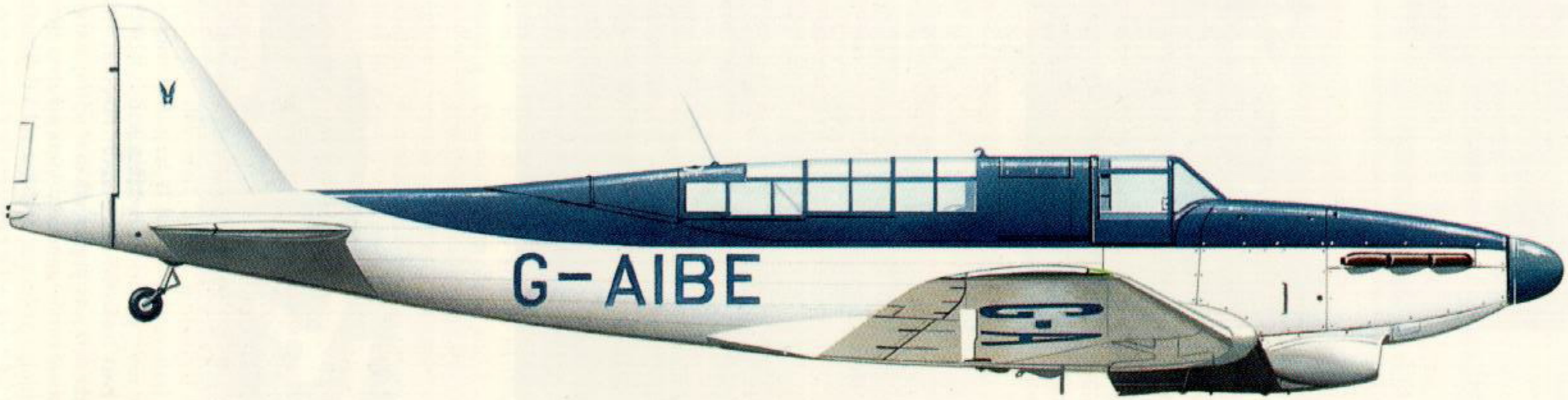
[1] See Profile No. 117: Defiant Mks I-III.

[2] Named after Dr. Yagi, a Japanese radio engineer who first designed an efficient aerial array for the reception of ultra-high frequency, short wave radio transmission. UHF television receiver aerials provide an everyday example of the yagi array.

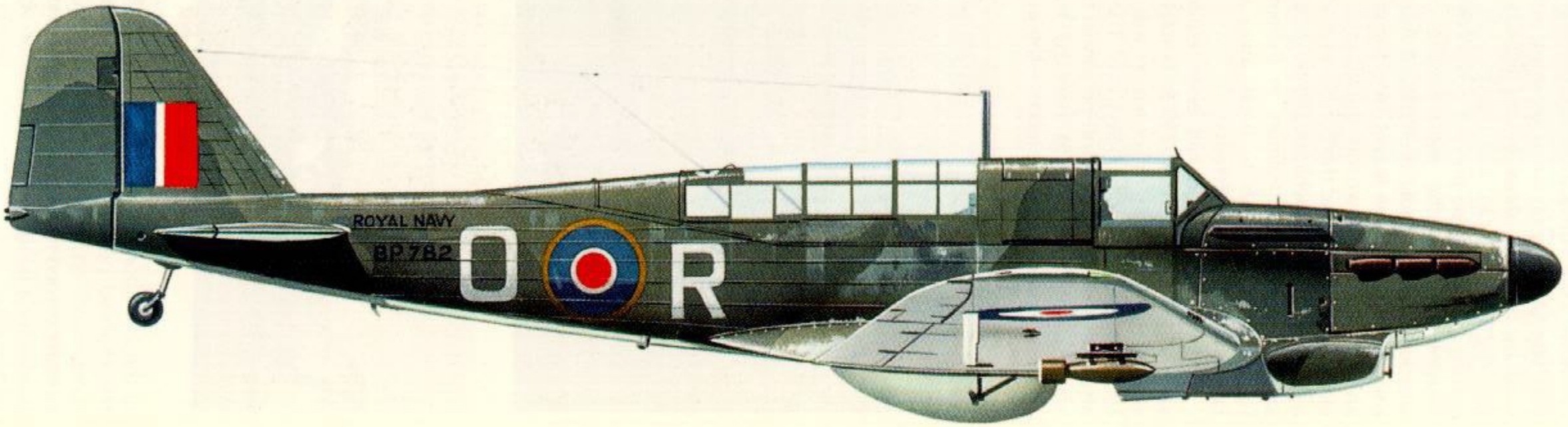
1



2



3



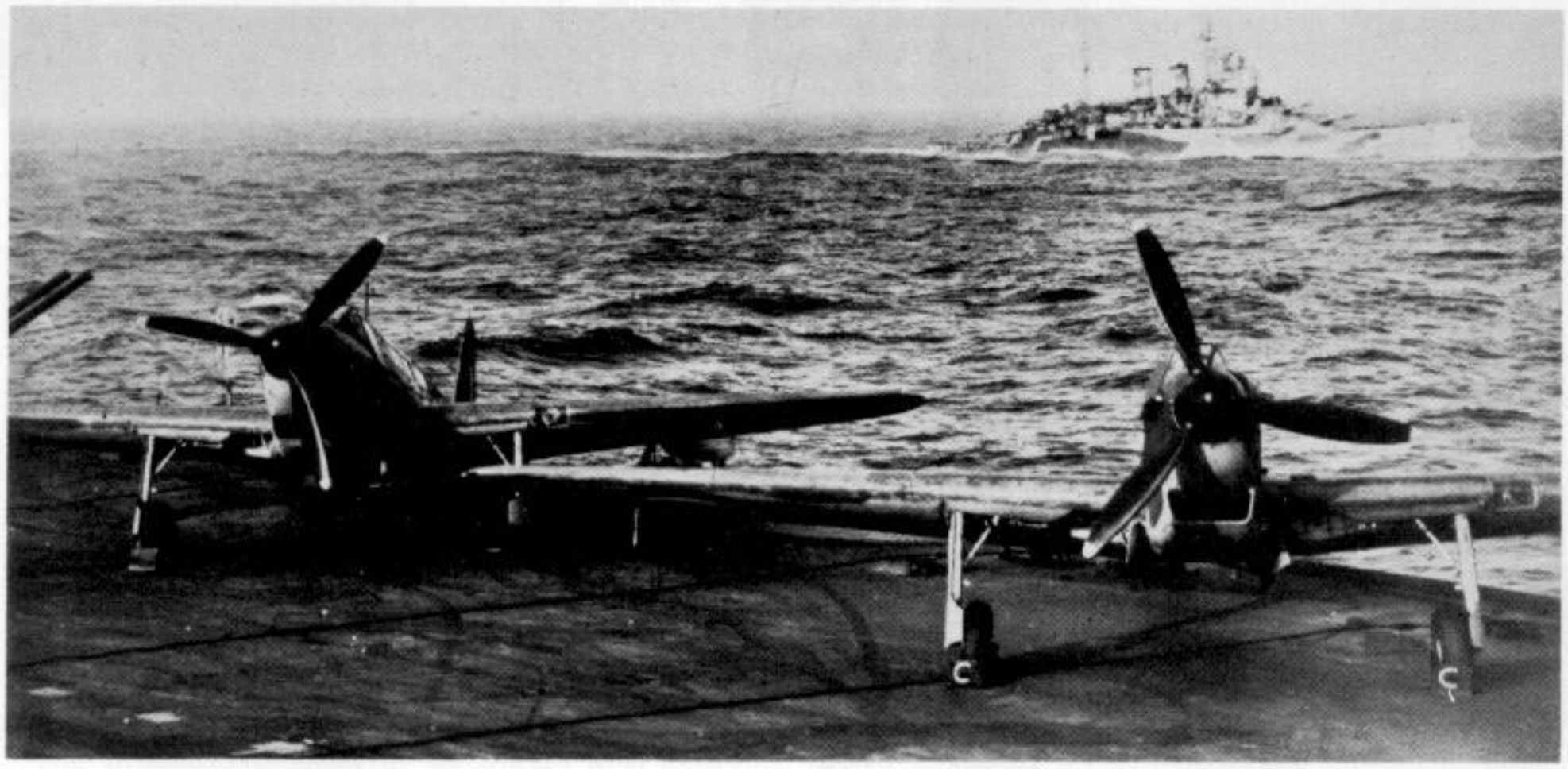
complained of the lack of a weapon, and individual aircrew devised their own rearward defences. The ubiquitous Thompson Sub-machine Gun was favoured by most, and was used by many to deter enemy fighters from pressing their attacks, and the 1.5-inch signal (Verey) pistol was also pressed into service as a weapon. Perhaps the most bizarre 'secret weapon' was a bundle of standard Admiralty issue toilet paper, the leaves held together by an elastic band. Thrown into the slipstream, the elastic band broke and the bundle 'exploded'—a shock-effect device which was thought to have saved a number of Fulmars *in extremis* by forcing their assailants to break away in the face of this unknown defence.

Although the Fulmar had been required to carry a pair of 100-lb or 250-lb bombs for a secondary strike role, no provision was made for the carriage of such a heavy load. The lesser alternative of eight 20-lb anti-personnel bombs was carried from time to time by Fulmars escorting torpedo striking forces—the purpose of the small bombs being to inflict casualties on the exposed personnel manning the flak batteries—and on one occasion 809 Squadron Fulmars carried four 40-lb GP (General Purpose) bombs for a fighter-bomber attack on shipping off Norway.

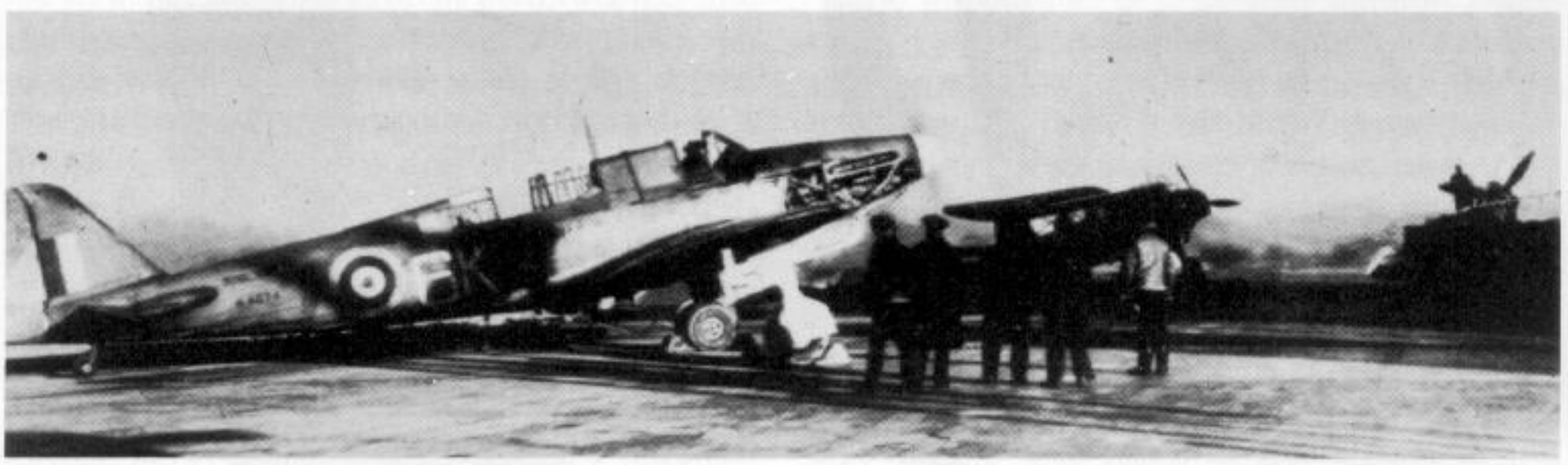
Some late-production Fulmar Is and most Mark IIs were modified to carry a 60-(Imperial) gallon flush-fitting jettisonable fuel tank under the fuselage centre-section. The modification was approved during the summer of 1941 but not generally incorporated before the end of the year, and it involved, besides the provision of attachments, fuel lines, and controls, local strengthening of the fuselage to carry the additional 550 lb weight. In May 1942, following

By far the greatest number of surviving photographs of Fulmars are those taken by Victorious' *Photographic Section between the end of 1941 and the late spring of 1942, while the ship was operating with the Home Fleet, supporting the convoys to North Russia. Here, all 12 of 809 Squadron's Fulmar Is and IIs are ranged, probably in preparation for disembarkation to Hatston, at the end of 1941.*
(Photo: via T. F. H. Spriggs)

A number of 809 Squadron Fulmars had personal emblems. Unfortunately, the identities of the aircraft and of their owners were not often recorded. The extremity of climate experienced during winter operations between the Orkneys and Bear Island is reflected by the state of the finish on the aircraft and the clothing worn by the two New Zealanders sitting on Kia-ora Katoa.
(Photo: IWM, ref. A7570)

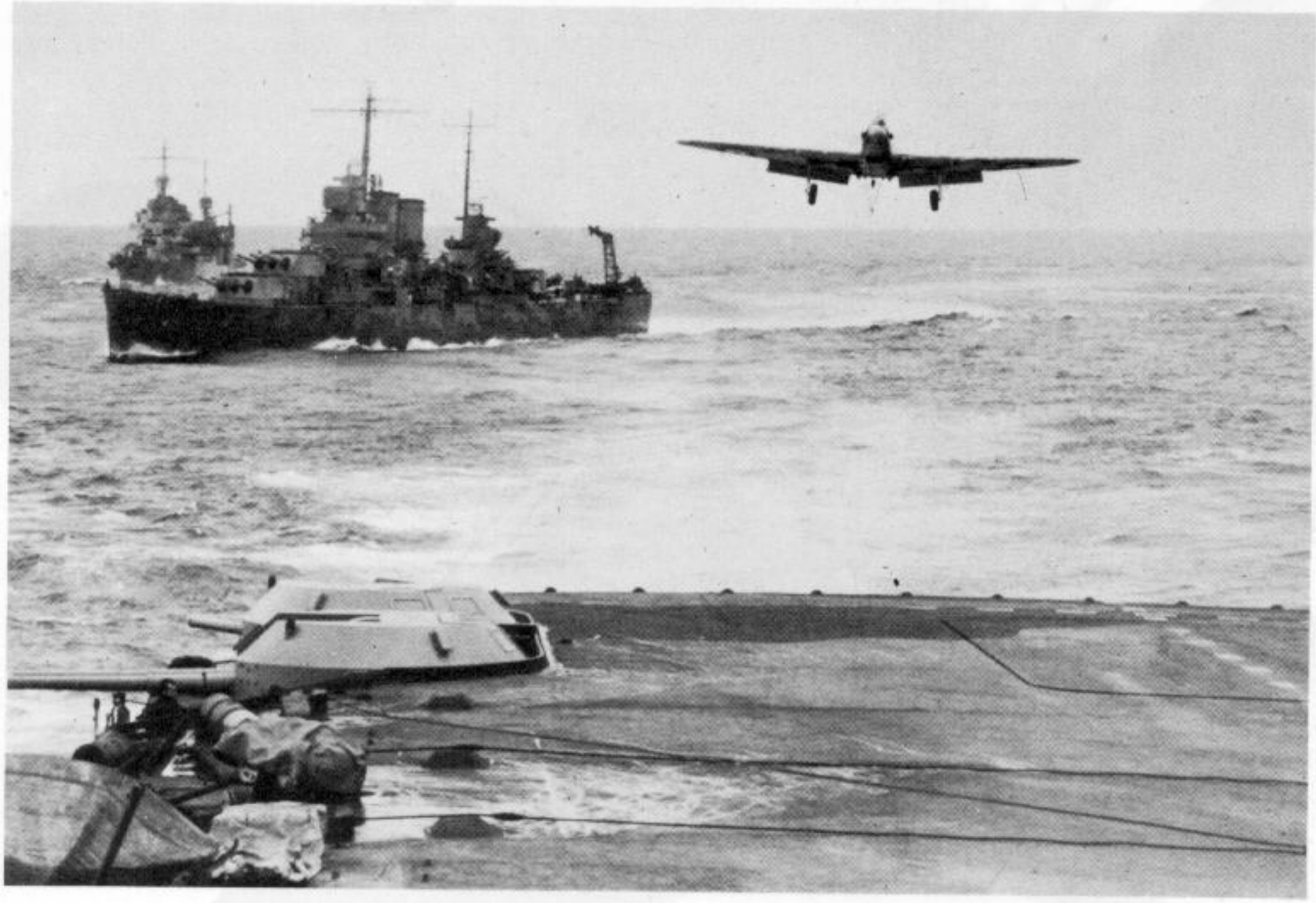


The aircraft are Fulmars, the battlecruiser is Renown, *but the carrier—*Victorious—*and area—Arctic Ocean, are very different: 809 Squadron at readiness during a convoy cover operation. The right-hand aircraft lacks the aperture in the starboard wing leading edge, indicating that the G.42B cine-camera gun has been removed.*
(Photo: IWM, ref. A8141)



Arctic sunlight on N4074 during the short winter day at Seidisfjord, Iceland, a Home Fleet refuelling anchorage. Engine runs were an almost daily necessity in cold weather conditions, as well as after maintenance.
(Photo: via T. F. H. Spriggs)

Given the brisk wind usually to be found in Scapa Flow, Fulmars could be flown off with the ship at anchor. '6-J' has its tail up after only 125 feet, with another 370 feet of Victorious' flight deck ahead. The port side crane is in use for storing ship. The battleship astern is Prince of Wales. (Photo: IWM, ref. A6120)



The US Navy heavy cruiser Wichita *cuts in between* Victorious *and USS* Tuscaloosa *in what must have been an unpopular manouevre, as far as the Fulmar crew were concerned. Units of the US Atlantic Fleet were attached to the Home Fleet during the spring of 1942, following the deployment of many Royal Navy heavy units to the Indian Ocean. Note that No. 1 arrester wire has not yet returned to its proper position across the deck after the preceding landing.* (Photo: IWM, ref. A9482)

flight trials, an order was placed for the necessary fittings to enable all Fulmars capable of carrying the drop tank to carry and release a 250-lb or 500-lb bomb.

The pressing need for a shipboard fighter-bomber had arisen from the near-encounter with the Japanese carrier fleet off Ceylon in April 1942. It was clear that the Albacore would have little chance of return, let alone success, in the face of opposition from A6M2 *Zero-Sen* carrier fighters, and the bomb-carrying Fulmar offered the only short-term solution to the Royal Navy's need for a relatively high-speed day strike aircraft. The Fulmar proved to be an effective fighter-bomber, delivering its bomb in a low-level or shallow dive-bombing attack, but it was never called upon to do so in anger.

Front-line Service

The first squadron to be allocated Fulmars was 806, which had operated from shore bases during the Norwegian campaign and the Dunkirk evacuation. Three Fulmars were allocated during the second week in June 1940, while 806 was at RN Air Station Eastleigh. At the end of the month, the Skuas and Rocs still retained by the squadron embarked in the new armoured carrier *Illustrious* for the ship's work-up in Bermuda[1], leaving a nucleus of air and ground-crews to learn about the new aircraft, more of which were delivered during the carrier's absence.

At the end of July *Illustrious* returned having lost all nine Skuas and Rocs during the work-up. Officially 806 had been a Fulmar squadron since July 15, when the last of 12 aircraft was delivered, and it embarked in the carrier on August 11 for an abbreviated Fleet work-up at Scapa Flow. When *Illustrious* sailed from Scapa on August 22, 806 had been expanded to a 15-aircraft squadron, and the ship had embarked four spare Fulmars, which would be the only reserve aircraft available in the Eastern Mediterranean for some time to come.

[1] See Warship Profile No. 11: HMS *Illustrious*.

"DONALD DUCK"
ROYAL NAVY
6J

Fairey Fulmar II (X8559) in the markings of 809 Squadron, Royal Navy, aboard HMS *Victorious* in Home waters during the spring of 1942. This particular Fulmar was the 35th built of the last series of 200—construction totals of Mk Is and IIs being 250 and 350 respectively.

P. Endsleigh Castle, ARAeS

Not everyone was impressed with the new fighter. For example 804 Squadron, based at RNAS Hatston (and armed with Sea Gladiators for the defence of Scapa) had no favourable immediate reaction. 'This monstrous aircraft turns out to be constructed like a battleship, to weigh 9,000 lb, and to have an enormous rear cockpit compartment with room for a dozen "lookers", each armed with a wireless set.'

A fortnight after 806 Squadron's departure from the Orkneys area, 808 Squadron's 12 Fulmars arrived to take over 804's defensive task, while the latter re-equipped with the first ex-French Grumman G-36A, named Martlet Is in RN service[1]. Intended for service in the second armoured carrier, *Formidable,* 808 had been formed at RNAS Worthy Down on July 15 and had worked-up over Hampshire as the Battle of Britain had begun. On September 5, the Squadron moved to the quieter skies over RAF Station Castleton, near Hatston, to complete training and provide fighter patrols over the Home Fleet's base. No action attended the operational flying, but, like 804 Squadron, 808 was included in RAF Fighter Command's Order of Battle for the Battle of Britain—the only two Royal Navy units to be so included.

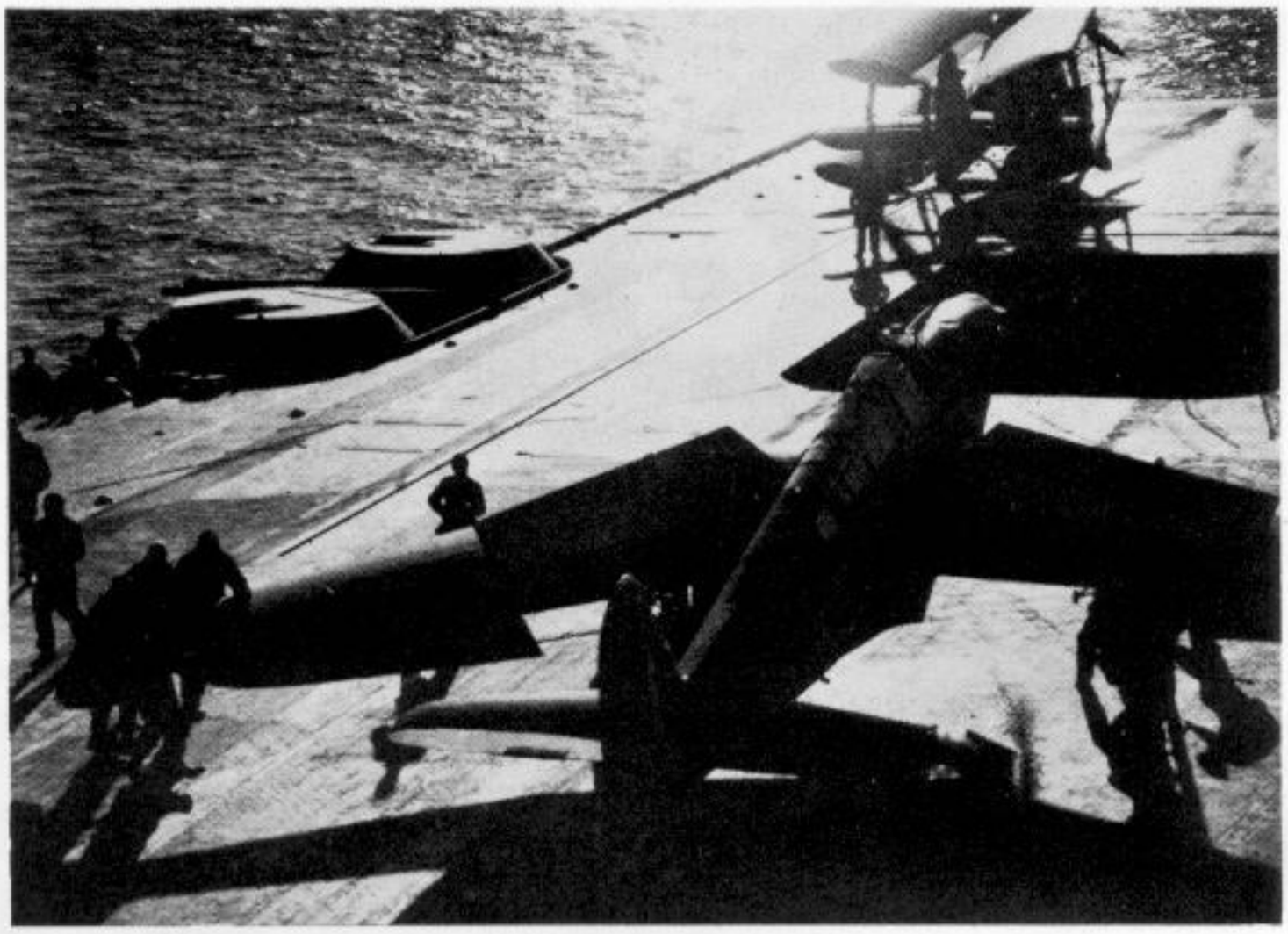
A third Fulmar squadron—807—formed at Worthy Down on September 15 1940, intended for *Illustrious'* other sister-ship, *Victorious,* and on October 8 803 Squadron began to rearm from Skuas to Fulmars at RNAS Donibristle, after flying ashore from *Ark Royal.* On the next day, 808 Squadron was ordered to take the place of 803 in *Ark Royal,* which would be returning to Gibraltar at the end of the month. The ship had already been offered a second Fulmar squadron to replace the Skuas of 800 Squadron, but Vice Admiral Sir James Somerville, commanding 'Force H' of which she was a part, had preferred to retain the squadron of Skuas for their dive-bombing potential.

The ship/squadron allocations had already been upset by the embarkation of 808 in *Ark Royal* on October 31 1940, and in the end neither 807 nor 809 Squadron—formed in January 1941 for *Indomitable*—ever embarked in their intended ship. No. 803 went to *Formidable* in place of 808 Squadron at the end of November 1940, and *Victorious'* completion was so delayed that 807 Squadron had been embarked in *Ark Royal* for over a month before the former ship was ready to operate any aircraft, and for three months before 'Vic' finally embarked her 'own' 809 Squadron in mid-July 1941.

No. 809 was, in fact, the sixth Fulmar squadron. In October 1940, 12 Fulmars, with air and ground crews, had been embarked in the merchant ship *Henry Stanley* and taken out to Takoradi. The aircraft were erected and their engines tested before the ship reached Takoradi, so that when they were put ashore little time was lost before they set out for Egypt via the 'Takoradi Route' over French Equatorial Africa. After arrival at RNAS Dekheila (five in November and seven in December), the Fulmars were formed as 805 Squadron to provide a 'spare' fighter squadron for embarked or shore-based operations.

A few Fulmars were delivered to RNAS Yeovilton for the Fighter School, where they served with 759 Squadron from early 1941, but the first second-line squadron to form with Fulmars was 787, a Fighter Development Unit which formed with ex-804 Squadron aircrew, five 'crisis Gladiators' and three Fulmars on March 3 1941. A week later, also at Yeovilton, 804 Squadron rearmed from Martlets to Fulmar IIs. This unit was the least conventional of all the wartime naval fighter squadrons, for it was intended for operations from the Fighter Catapult Ships *Pegasus, Maplin, Ariguani, Springbank,* and *Patia,* as one-shot interceptors, protecting convoys from the Focke-Wulf FW 200 C Condor[2] maritime patrol aircraft which were bombing the merchant ships and reporting their positions to U-boat packs. *Patia* was sunk on April 27 1941, before she could embark aircraft, and *Maplin* was altered to operate Sea Hurricanes[3], but Fulmars embarked in the other three ships and carried out five combat launches between June 7 and September 18. Only one FW 200 was damaged, but on the other hand, only one Fulmar was lost, and that in a flying accident as it approached its parent base at RAF Sydenham, Belfast.

No. 807 Squadron had embarked in *Pegasus* during December 1940 and January 1941, to prove the idea of the Fighter Catapult scheme, and a single combat launch had been made on January 11 1941. No Fulmars were embarked in the Catapult Ships after HMS *Springbank* was

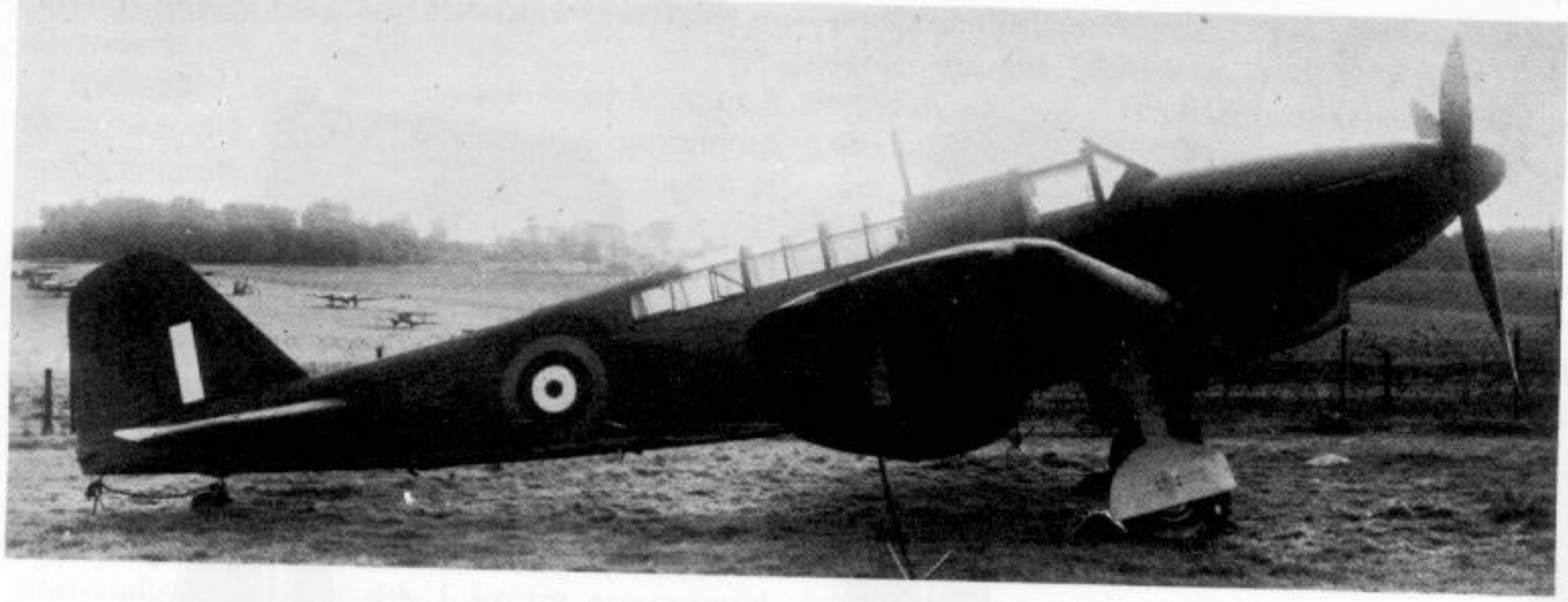


'6-D' of 809 Squadron is folded, its engine still running, preparatory to being struck down Victorious' forward lift. The slot in the port side of the deck is the track for the accelerator trolley.
(Photo: IWM, ref. A7977)

[1] Profile No. 53: Martlet I (F4F-3 Wildcat).

[2] See Profile No. 99: FW 200 Condor.

[3] Profile Nos. 111 & 24: Hurricane/Sea Hurricane Mks I & II respectively.



A Fulmar Mark II (X8641) of the third production batch, at Boscombe Down for handling trials with the 60-gallon ventral jettisonable fuel tank late in 1941.
(Photo: IWM, ref. MH6281)

sunk (after launching N4065) on September 27 1941, but 804 Squadron retained three Fulmars as a reserve for its 12 Sea Hurricanes until January 4 1942.

The last front-line squadron to re-arm—as opposed to form up—with Fulmars was 800, which received a dozen Mark IIs at Lee-on-Solent in May 1941. Almost immediately, three 'Flights' of 800 Squadron—'X', 'Y', and 'Z'—were formed to act as navigational guides for RAF Hurricanes being flown from carriers to Malta. Fulmars were in short supply at this stage, and aircraft were requisitioned from other front-line squadrons—six from 809 for 800X, two from 804 for 800Y—and the front-line reserve was stripped to provide the 27 aircraft required for the four 800s. 'Z' Flight embarked in *Victorious* in time to take part in the operations against the German battleship *Bismarck*, and four Fulmars were launched in an attempt to shadow the enemy by night. 'Y' Flight took its three aircraft to *Argus* but returned to Lee in mid-June without seeing action, but a rather more distinguished career was enjoyed by 'X' Flight. On May 21 1941, six Fulmars led 47 Hurricanes from *Ark Royal* and *Furious* to Malta. The Fulmars were employed as night intruders, attacking Sicilian airfields with front-gun strafing and 20-lb bombs. Few proper spares and no reserve aircraft were available, but 800X Squadron—as it had been renamed after arrival—operated for six months, destroying three enemy aircraft over the darkened airfields, and a score of others on the ground. The last survivor was flown out by Lieutenant C. J. Coxon, RNVR in mid-November, landing at an advanced Landing Ground in Cyrenaica. On arrival at RNAS Dekheila his much-patched Fulmar was condemned and reduced to produce.

The 'parent' Squadron—800—embarked in

The Auxiliary A/A Ship Springbank *carried a Fulmar II of 804 Squadron from April to 27 September 1941, when she was torpedoed and sunk by U201 in mid-Atlantic. Throughout the period her aircraft was N4065, which survived two combat launches, on 10 June and 18 September 1941, flown on both occasions by Petty Officer E. A. Taylor. As a Fighter Catapult Ship,* Springbank *was fitted with a fixed athwartship cruiser catapult and a Type 281 air warning and control radar. The four twin 4 in mountings were controlled by a radar-less High Angle Control System director on top of the bridge but for barrage firing, radar ranges and bearings could be 'fed in' from the Type 281.*
(Photo: IWM, ref. A5522)

4

5

6

Furious in July 1941, and then in *Indomitable* in October.

Thereafter, only one more Fulmar squadron (884) was to be formed and see embarked service, another formed in the Middle East and saw action over convoys off the Egyptian coast (889) and two others formed in the United Kingdom but saw no action (886 and 887).

A night-fighter training and trials squadron (784) formed at Lee-on-Solent on June 1 1942. This squadron moved to RAF Drem, near Edinburgh in the following November and, after increasing to a dozen Fulmars, began to train crews for the Firefly NF.II. This aircraft never materialized in a suitable form for operational service, but in February 1944 three front-line Fulmar night-fighter flights were formed for the escort carriers *Nairana, Campania,* and *Vindex*. All three flights undertook deck-landing training and evaluation aboard *Campania* and *Nairana,* but only the former ship incorporated three Fulmars into her own 813 Squadron, using them on the Gibraltar and North Russia convoy routes.

On February 8 1945, a Fulmar II night-fighter (DR743) attached to *Campania's* 813 Squadron, was flown off at dusk to drive off a shadower, which was hanging around the skirts of a Russia-bound convoy. The Observer obtained radar contact and the Fulmar closed to within 3,000 yards of its quarry before the AI IV failed. Returning to the ship in bad weather, the aircraft failed to pick up an arrester wire and it was written off in the safety barrier. So ended the Fulmar's last operational sortie from a carrier.

Several other second-line squadrons acquired or were equipped with Fulmars. These included: 772 and 775 Squadrons—the Fleet Requirements Units at RN Air Stations Machrihanish and Dekheila—and 748 Squadron, the Naval Fighter Pool at RNAS St Merryn, Cornwall.

A second-line squadron which enjoyed a period of front-line service with Fulmars was 795—the East African Fighter Pool—based at Port Reitz, Mombasa. The six Fulmars of A Flight flew to Madagascar in September 1942, following the successful occupation of Diego Suarez, and served there as TAC/R (tactical reconnaissance) fighters until mid-October, when Vichy French opposition finally ended.

The Fulmar's career as a shipboard day-fighter ended at dusk on August 12 1942. It continued to serve aboard *Victorious* and *Illustrious* until November 1942, 809 Squadron in the former as a specialized TAC/R (or Tactical Reconnaissance) unit, and 806 in the latter carrier as a reconnaissance/fighter-bomber squadron. Another unit, 886 Squadron, served with RAF Fighter Command from mid-August 1942 until March 20 1943, providing escorts for convoys and warship movements off the east coast of Scotland from RAF Stations Peterhead and Turnhouse. Like 887 Squadron, which had worked up as a second Fulmar TAC/R unit, 886 was rearmed with Seafires[1] in March 1943, but the last Fulmar squadron to go was 809, which rearmed with Seafires in April.

As the Fulmars were withdrawn from the fighter squadrons in 1943, a few were allocated to Barracuda squadrons, to give the ex-Swordfish[2] and Albacore pilots handling experience in modern monoplanes. 815 Squadron, flying Swordfish on convoy patrols in Egypt, acquired a Fulmar in the summer of 1943, shortly before disbanding to reform in the UK with Barracudas. The Fulmar was used to familiarize the pilots with the monoplane and also for low-level bombing and simulated torpedo attack practice —'a home-made monoplane OTU' (operational training unit) as the Squadron called it.

The availability of the Firefly from 1945 led to the rapid withdrawal of the Fulmar from all units, as the newer aircraft could fulfil all the trials and training roles which had been the lot of the Fulmar. The first aircraft, N1854, survived; retained by Fairey Aviation as a 'hack' communications aircraft, with the civil registration G-AIBE, it had been modified to Mark II standards

[1] See Profile No. 221: Seafire Mks I-III.
[2] Profile No. 212: Swordfish Mks I-IV.

Key to colour side views

4 *Fulmar I, 803 Squadron, aboard HMS* Formidable, *Mediterranean 1941. Thistle badge on cowling is individual adornment of Lieutenant Donald Gibson, RN, senior pilot of 803 Squadron.*

5 *Fulmar II (X8812), with Operation* Pedestal *identification yellow wing leading-edge and tail assembly (fin only), of 809 Squadron aboard HMS* Victorious *for the August 1942 Malta convoy. Pilot: Sub Lieutenant (A) H. Morrison, RNVR.*

6 *Fulmar II (DR641) of 809 Squadron, wearing temporary markings for North Africa Operation* Torch; *Tactical Reconnaissance sorties from HMS* Victorious, *November 1942.*

A section of 800 Squadron Fulmars returns to Indomitable *during the Eastern Fleet's operations off Ceylon at the beginning of April 1942, when the Japanese carrier force was active in the area. The irregular light-coloured patch on the fuselage is the bare metal of the panelling.*
(Photo: G. Wallace)

Variations in Vokes' filters: a Fulmar II of the Reserve Aircraft Pool at RNAS Hastings, Freetown, taxies past the Defiant TTIs of 777 FRU Squadron. The combined air intake and radiator of the Fulmar made for a much cleaner 'tropicalised' form than the Hurricane, which had separate carburettor air and radiator intakes.
(Photo: IWM, ref. A22312)

by the installation of a Merlin 30. It also performed at many air displays until 1962, generally in the able hands of Peter Twiss, Fairey's Chief Test Pilot. Presented to the Royal Navy, it was housed at RNAS Lossiemouth—HMS *Fulmar*—for several years but is now in the keeping of the Fleet Air Arm Museum at RNAS Yeovilton, near Ilchester, Somerset.

Combat Career

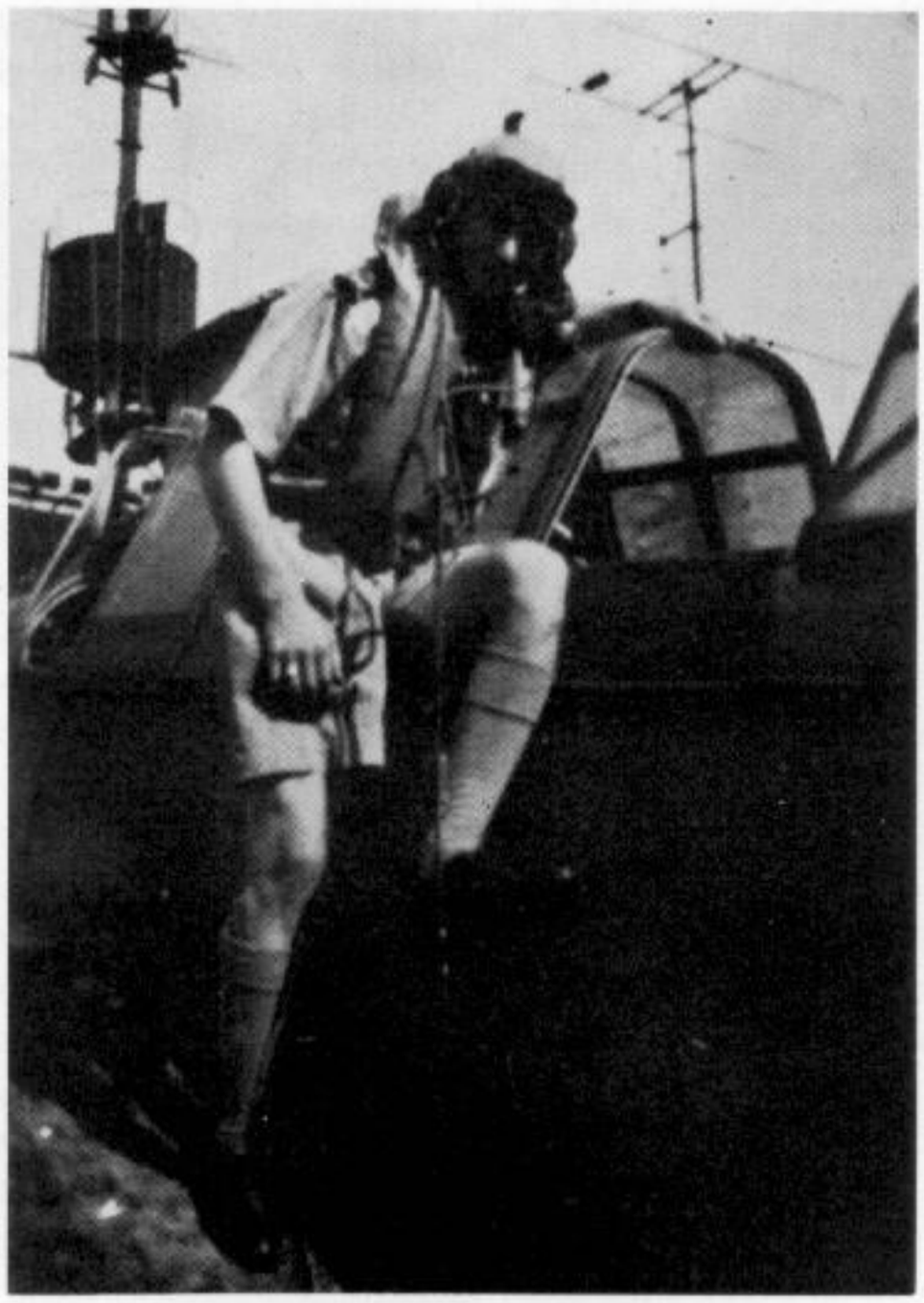
HMS *Illustrious* joined the Mediterranean Fleet on September 1 1940. Since June, the only carrier in the eastern basin of the Mediterranean had been *Eagle,* whose fighter complement had consisted of three Sea Gladiators flown by Swordfish pilots. They had achieved remarkable success against Italian reconnaissance bombers, but they could not provide air superiority over the Fleet. The 15 Fulmars of 806 Squadron did provide that superiority, establishing it almost immediately by destroying the 'shadowers' reporting the movements of the Fleet and breaking up the bomber attacks which usually followed. By the end of 1940, the sections led by Lieutenant Commander C. L. G. Evans, Lieutenant W. L. C. Barnes, Lieutenant O. J. R. Nicholls, and Sub Lieutenant S. G. Orr had destroyed 26 Italian aircraft and damaged as many again.

The low performance of the fighters—almost identical to that of the Savoia Marchetti S.M.79[1] bombers to which they were often opposed—was compensated by the radar fitted in the carrier, the Fighter Direction Officers (FDO) positioning the Fulmars to make the best use of their potential. Not until January 10 1941 was the defence organization overwhelmed, and then by large numbers of *Luftwaffe* aircraft, which inflicted severe damage on *Illustrious*.

Operating from Malta for the remainder of January 1941, 806 Squadron then moved in the following month to RNAS Maleme, Crete. From Egypt, 805 Squadron took over in Crete when the second armoured carrier, *Formidable,* arrived in the eastern Mediterranean, allowing 806 to join 803 Squadron in the new carrier. Hampered by a shortage of Fulmars, 803 and 806 operated from *Formidable* from mid-March until May 26 1941, when the ship was damaged, like *Illustrious,* by *Luftwaffe* attack. The combined 'game bag' of the two squadrons stood at 56 aircraft destroyed and 33 damaged—almost exactly half of the Fulmar's eventual total.

At the other end of the Mediterranean, 808 Squadron in *Ark Royal* opened their score on November 8 1940. The carrier had only recently been equipped with air-warning radar, and the FDOs lacked experience, so that the pilots' claims were markedly less numerous than 806 Squadron's, but many attacks were broken up and driven off. 807 Squadron joined *Ark Royal* at Gibraltar on April 4 1941, replacing the Skuas of 800 Squadron, and giving the ship a nominal

[1] See Profile No. 89: S.M. 79 Sparviero.



Sub Lieutenant G. Wallace, an Fairey Albacore Observer, climbs into an 800 Squadron Fulmar before a long-range reconnaissance to search for the Japanese Fleet in the Indian Ocean. The Fulmar squadrons had relatively few Observers and the Telegraphist/Air-Gunners who made up the back-seat numbers were not trained for full navigational duties of this nature. The lever in the triangular recess is the control for the inboard flap fold; when selected to 'Fold', the flaps folded upwards and forwards automatically as soon as the engine fuel cock was turned off.
(Photo: G. Wallace)

Captain T. Troubridge, RN, commanding Indomitable, *climbs out of an 800 Squadron Fulmar II at RAF Port Reitz, Mombasa, after flying ashore from the carrier in June 1942. Note the sliding panels and the braced, hinged panels which gave the Observer an undistorted range of direct vision through which to take compass bearings.*
(Photo: G. Wallace)

X8569 is disentangled from Formidable's *arrester wires by a mixed flight deck party which includes Royal Marines as well as seamen.*
(Photo: IWM, ref. A9069)

strength of 24 Fulmars. Three major convoy operations were supported by *Ark Royal* up to her loss to a U-boat torpedo in November 1941, as well as numerous Malta fighter ferrying operations. Together, 807 and 808 destroyed 30 and damaged 15 enemy aircraft before the sinking, following which 808 was disbanded.

No. 807 Squadron continued to operate from RAF Station North Front, Gibraltar, with occasional detachments embarking in the small and slow carrier *Argus*. From Gibraltar they flew anti-submarine patrols in the Straits—actually sighting and strafing a number of U-boats, as well as coastal reconnaissances off French Morocco. From April 1942, 807 was more frequently embarked, in *Argus* and *Eagle*, and in June 1942 took part in a hard-fought Malta convoy (Operation *Harpoon*), in which at least five more enemy aircraft were shot down, but at the cost of three Fulmars. On return from this operation, 807 was withdrawn to the UK, to become the first Seafire squadron.

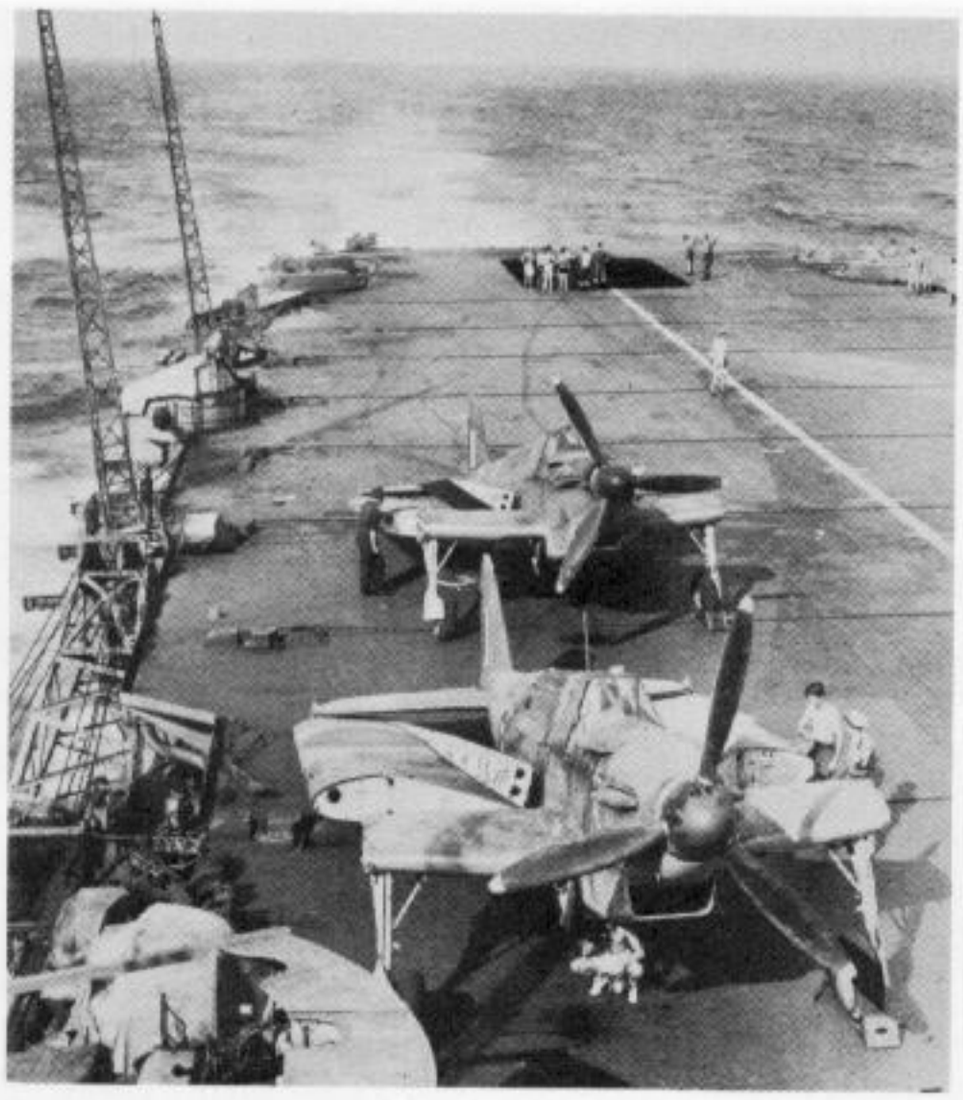
The Fulmar had one more major battle to fight in the Mediterranean. In August 1942, a large convoy was sailed for Malta. One of the three carriers of the escort was *Victorious*, with the 16 Fulmars of 809 and 884 Squadrons embarked for the low-level air defence task, top cover being provided by 44 Sea Hurricanes and nine Martlets aboard *Eagle*, *Indomitable*, and *Victorious*. *Eagle* was sunk by a U-boat on August 11, the day before the air battle began, and *Indomitable* was badly damaged by German dive-bombers on August 12. Thirty-nine Axis aircraft were shot down by naval fighters on August 11 and 12, the two Fulmar Squadrons claiming to have destroyed nine, probably destroyed two, and damaged one aircraft, for the loss of only three Fulmars.

By the time of the *Pedestal* convoy, 809 Squadron had been embarked in *Victorious* for more than a year and its only other major engagement had been on July 30 1941, when escorting an Albacore strike on the Norwegian harbour of Kirkenes. On that occasion the squadron had lost two Fulmars but had shot down two Messerschmitt Bf 110s and a Bf 109. Forty miles away, at Petsamo (now Pechenga), 800 Squadron had lost two Fulmars and had shot down a single Bf 109 while escorting a simultaneous strike from *Furious*.

When the Fulmar is compared with its land-based Axis and Vichy contemporaries, it is surprising that *débacles* were rare. The first concerned 803 Squadron, operating from Lydda, in Palestine, at the beginning of the Syrian campaign. Six Fulmars were covering cruisers off the Syrian coast on June 8 when they were 'bounced' by Vichy Dewoitine D.520s[1]. No claims were made against the French, but three Fulmars were lost outright, one returned damaged beyond repair, and a fifth was less seriously damaged. Only three Fulmars were left to 803, which was withdrawn and rearmed with RAF Hurricanes, as was 806.

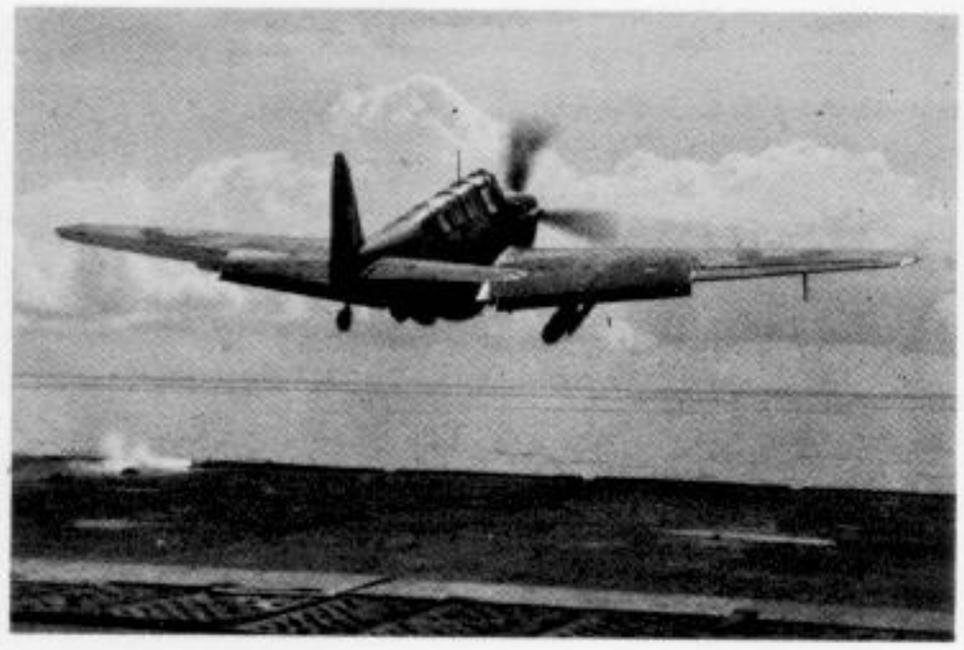
In February 1942, 803 and 806 Squadrons were rearmed with Fulmars and sent out to Ceylon, where an RAF General Reconnaissance squadron—No. 273—had been hurriedly equipped with about eight Fulmar IIs from the RN reserve at China Bay. The two naval squadrons had

[1]See Profile No. 135: D.520



After the Japanese raids on Ceylon on April 5 and 9 1942, the surviving Fulmars of 803 and 806 Squadrons were embarked in Formidable *and* Indomitable. *Two worn Fulmar IIs of 803 Squadron undergo routine maintenance abaft* Formidable's *island as the carrier pounds across the Indian Ocean, followed by* Indomitable *– skilfully obliterated from the original negative by the wartime censor as her existence had not been made known to the British public at this stage.*
(Photo: IWM, ref. A9711)

806B Squadron re-embarked in Illustrious *on 29 May 1942, 1942, to provide the ship with a long-range reconnaissance fighter component for Indian Ocean operations.*
(Photo: IWM, ref. A9066)



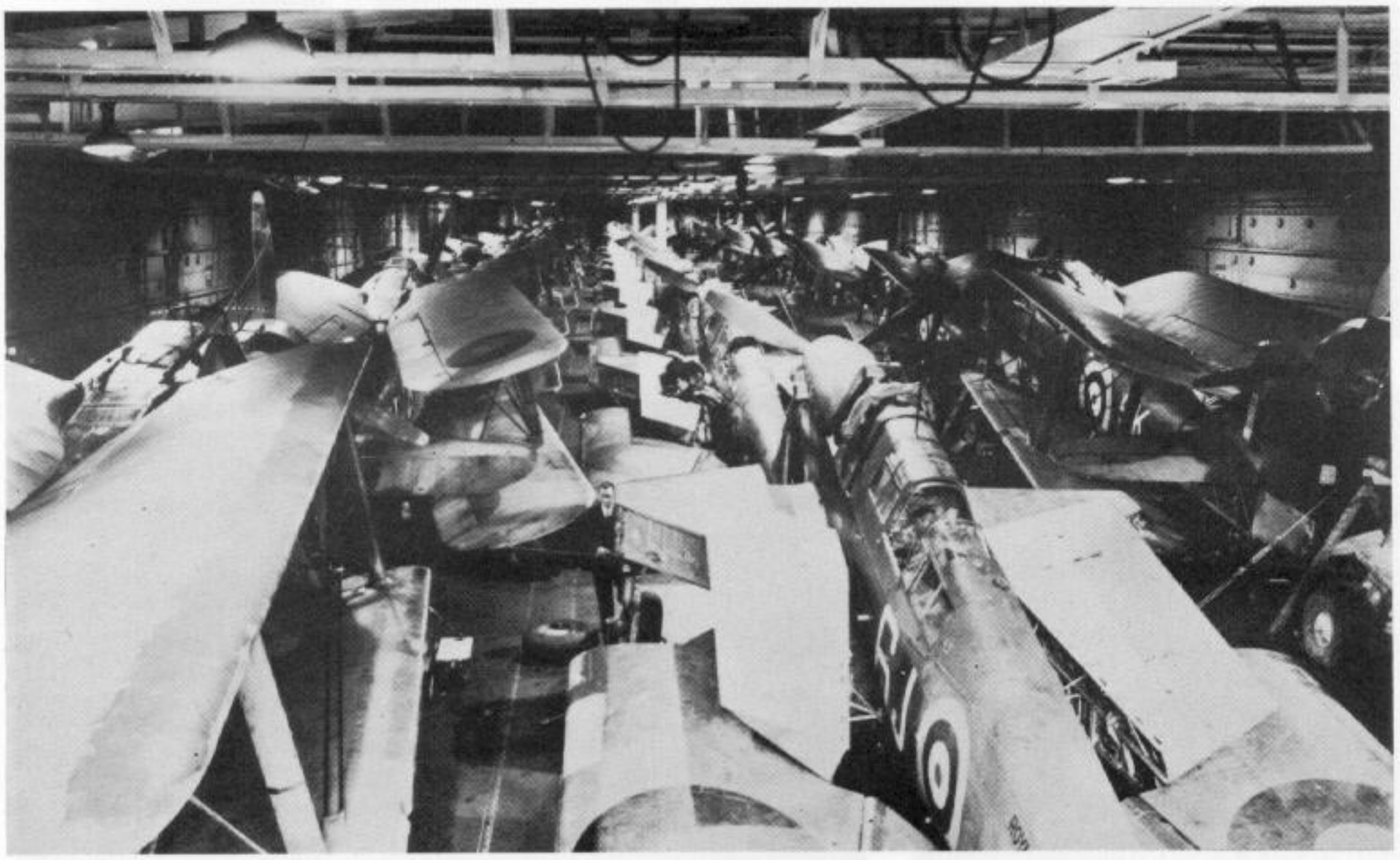
A drop-tank laden Fulmar II of 806 Squadron climbs away from Illustrious *to fly a reconnaissance sortie over the Bay of Bengal in August 1942. The perforated plating in the foreground is part of the wind screen intended to protect aircraft on deck from the elements.*
(Photo: IWM, ref. 2877)

After the loss of Ark Royal *in November 1941, her 807 Squadron was based at Gibraltar, embarking from time to time in the old carrier* Argus *until June 1942. Here, two Fulmar IIs are ranged for take-off as the 'Ditty-Box' swings into wind off the Spanish coast.*
(Photo: IWM, ref. A7338)

A pair of Fulmar Mk. NF. IIs of 784 Squadron occupy the foreground and assorted Hellcats, Avengers, and Barracudas of 768 Squadron the deck-landing training squadron – the centre and rear ground of Ravager*'s hangar. The three radar antenna pylons on each outboard mainplane can be seen on both Fulmars, and the two blast-tube openings for the 0.50-in Brownings can be made out on the left hand aircraft's port leading edge.*
(Photo: via R. Williams)

A Tactical Reconnaissance Fulmar II of 809 Squadron ranged ahead of Martlet IVs of 882 Squadron aboard Victorious *on November 8 1942 – the day of the Allied landings in North Africa. All the aircraft (Fulmar, Martlets, Albacores, and the Seafires to the left of the photograph) are wearing the 'Torch Star' in place of the national roundels and the fin flashes have been erased.*
(Photo: IWM, ref. A12950)

All six of 806B's Fulmar IIs ranged ahead of a dozen Martlet IIs of 881 Squadron ranged aboard Illustrious *during a combined exercise with the RAF units in Ceylon in June 1942. BP838 – 'O-P' – is carrying a drop tank (left foreground), as is 'O-Q' (facing the camera at right); there is also variety in the finish of the spinners, the rear aircraft in the centre of the deck having a very high gloss on its spinner, while that of the rear aircraft on the starboard side bears a six-pointed star. (HMS* Warspite *in background).*
(Photo: IWM, ref. A15152)



Hangar Scene: Eight of 809 Squadron's Fulmars sandwiched between the Albacores of 817 (right) and 832 (left) Squadrons in Victorious' *hangar. The bracing struts, inserted to restrain the folded mainplanes, can be seen below the '6' on the nearest Fulmar, with one arm attached to the folded flap and two to the mainplane, joining at a single-point attachment to the fuselage.*
(Photo: IWM, ref. A7279)

barely arrived before the Japanese carrier strike was delivered on Colombo on April 5. Taking-off from Ratmalana airfield as it came under attack, four out of six aircraft of 803 Squadron were shot down by the Mitsubishi A6M *Zero-Sen*[1] and Aichi D3A ('Val')[1] dive-bombers, but one enemy aircraft was claimed on this occasion.

On April 9, the Japanese attacked Trincomalee. Using their Fulmar IIs as single-seat fighters, No. 273 Squadron, RAF (with naval pilots predominating)[2] took off and intercepted the Nakajima B5N ('Kate')[1] attack-bombers. For the loss of one Fulmar, the RAF squadron claimed one B5N destroyed and five others damaged. A few hours later, 806 Squadron arrived just too late to save the carrier *Hermes* from air attack. They destroyed three of the Aichi D3As responsible but lost two Fulmars to the faster and more manoeuvrable Japanese carrier dive-bombers.

Altogether, 40 Fulmars are known to have been lost to enemy action in combat. Many of these were of course due to engagements with superior fighters, but bombers also took their toll. The Fulmar had so little speed in hand that stern chases were all too common. The prominent radiator under the nose and the lack of armour protection for the pilot, combined with the point-blank range required to achieve a decisive result with 0.303-inch guns, gave the enemy's gunners unreasonably good odds.

Notwithstanding its obvious shortcomings, the Fulmar gave a good account of itself, thanks to the determination of its aircrews. As Admiral Somerville said after one of the 1941 Malta convoy operations:

'It would appear that the Italian airmen have a higher opinion of the Fulmar than do our own Fleet Air Arm airmen. One Italian officer prisoner claims that he was shot down by a Hurricane.'

---

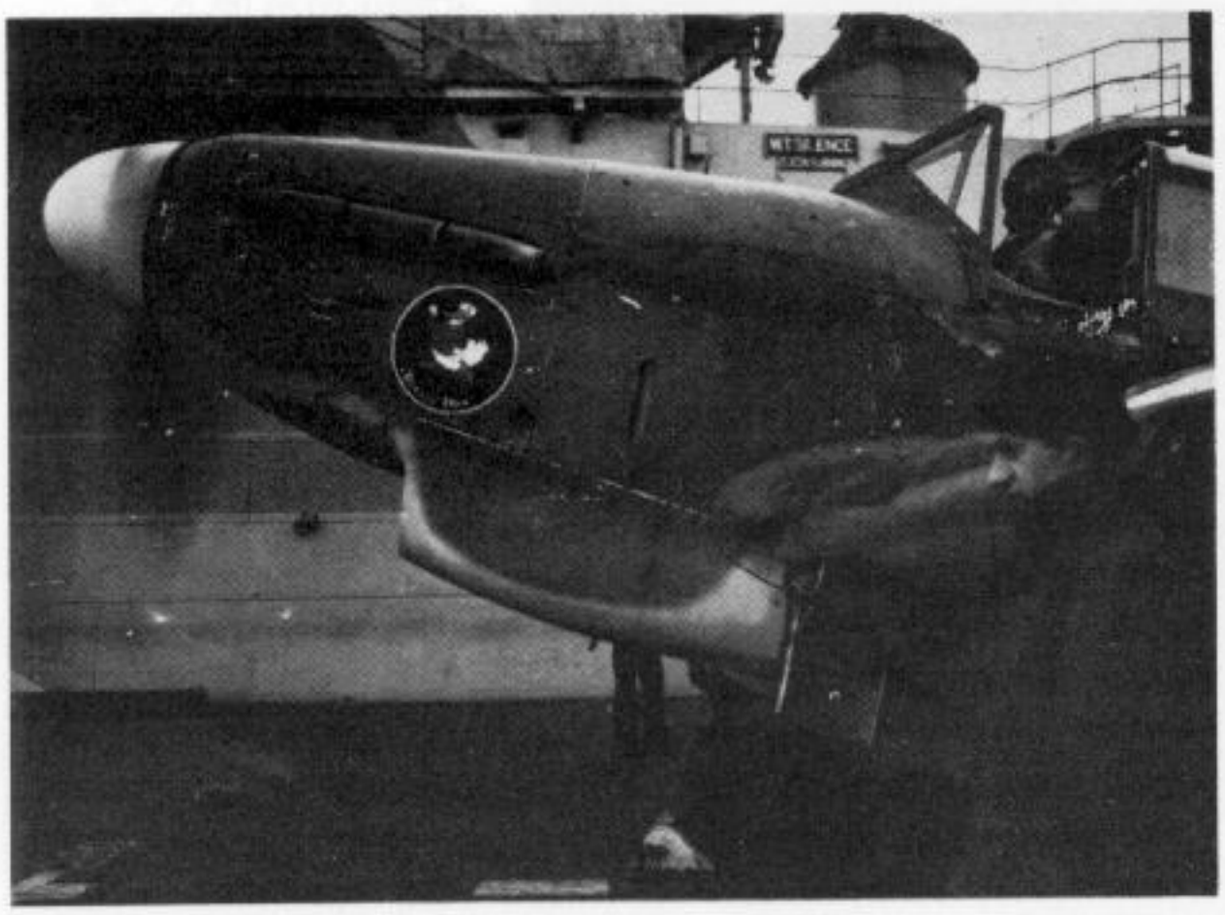
[1]See Profiles—Nos. 129 & 190: A6M2 & A6M3; No. 241: D3A; No. 141: B5N.

[2]Parachutes were apparently in such short supply that although the Fulmar and Hurricane parachute packs were identical, the nine naval pilots and two Air Force pilots in No. 273 had to use engine covers in place of the normal packs as seat cushions.

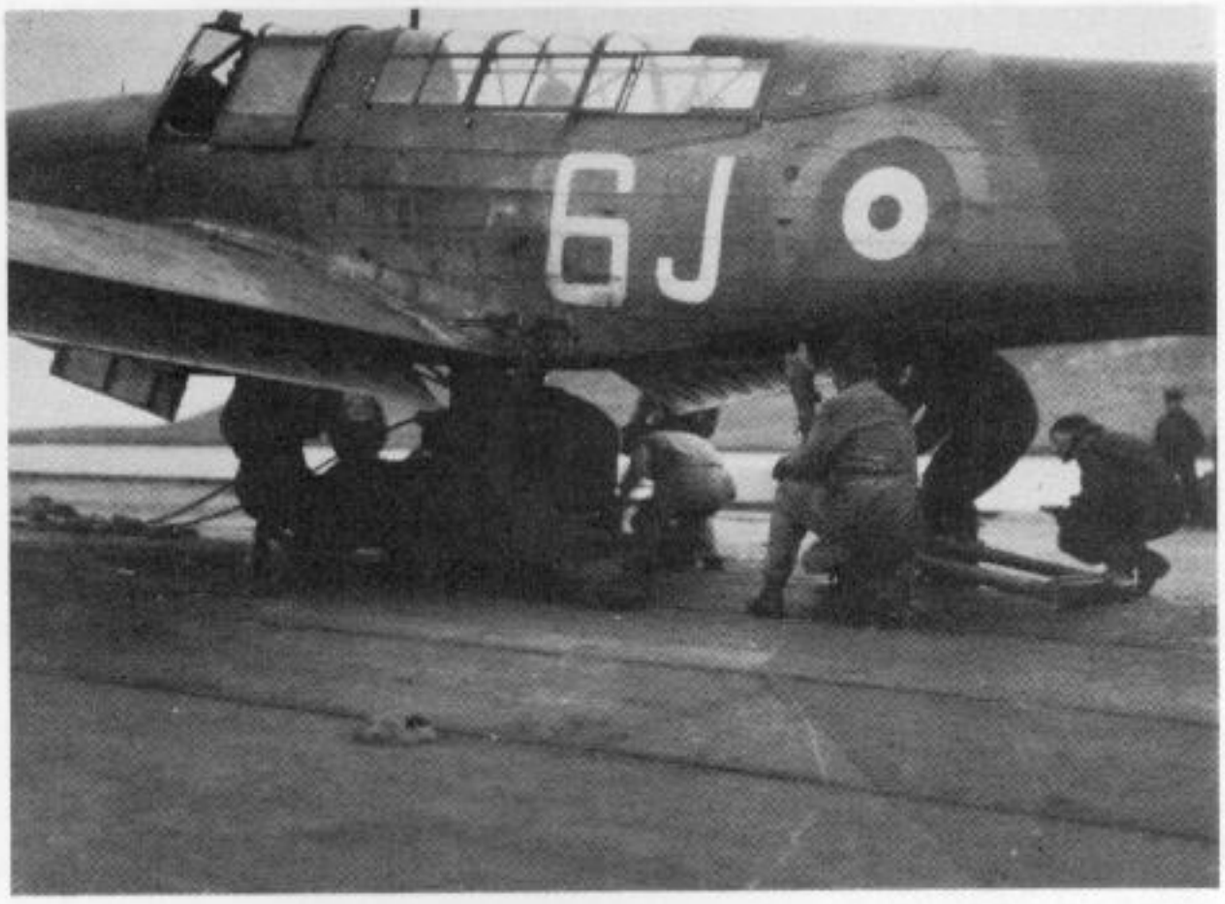
Argus-eye-view of an 807 Fulmar approaching to land over the two 4 in and one 2-pdr AA guns.
(Photo: IWM, ref. A7836)

1 Five minutes in the life of 809 Fulmar '6-J' (X8559): muffled against the icy slipstream, the pilot awaits his turn on the 'accelerator' while his chockmen stand by.
(Photo: IWM, ref. A6955)

2 Flags in hand, the Flight Deck Engineer Officer joins the huddle under X8559 (subject of the 5-view colour drawing), jacked up on the accelerator trolley but bearing its weight on its own main-wheels. The aircraft has been partially resprayed, obscuring all but the final '-59' of the serial, and the original yellow outline to the fuselage roundel can still be seen through the fresh coat of lighter grey. The wire running down the fuselage above the roundel is the dinghy release lanyard; unlike the Barracuda, the position of this line does not appear to have been marked with an eye-catching outline by any front-line squadron or any known training unit.
(Photo: IWM, ref. A7530)

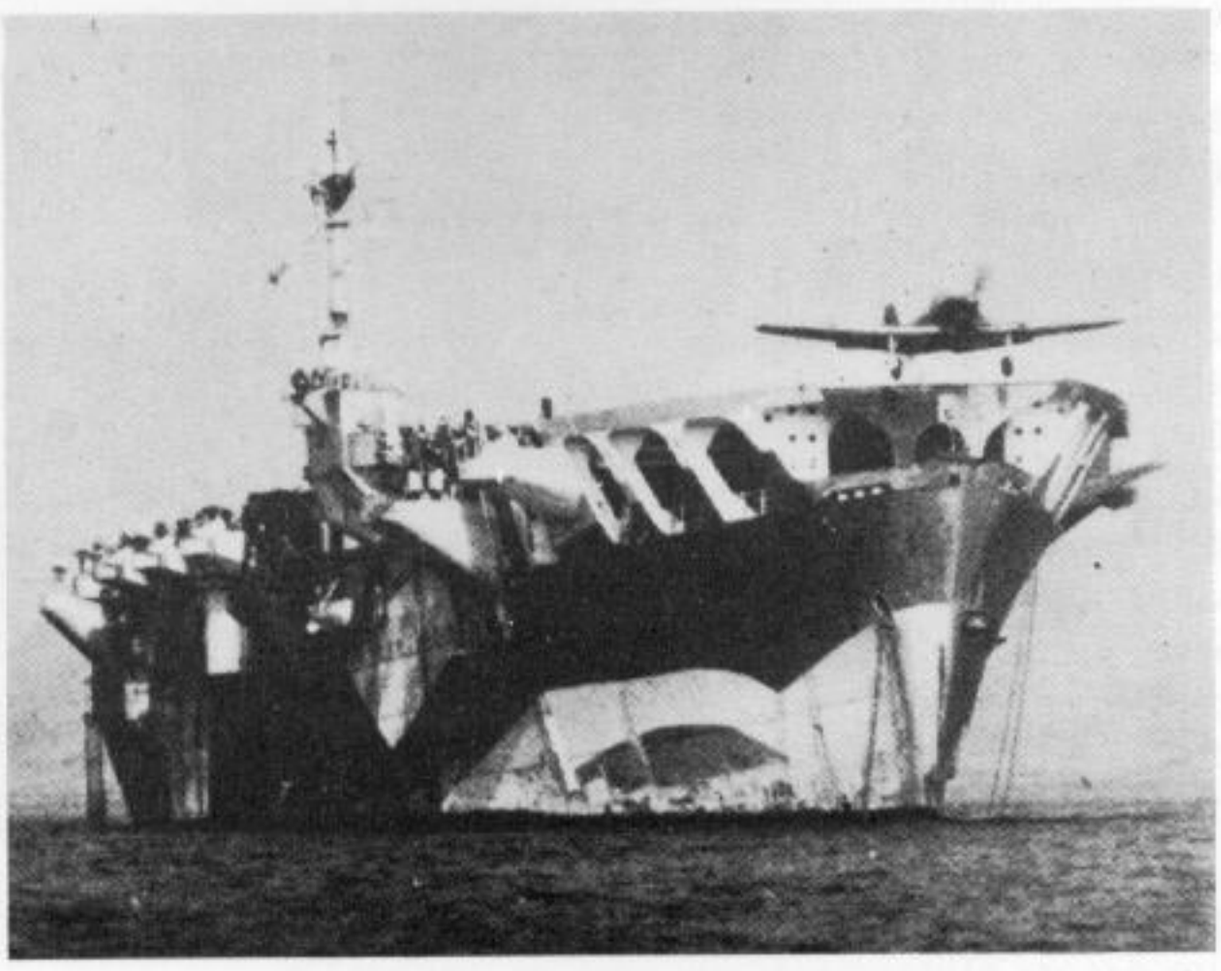


1



2

3



4

SPECIFICATION

Construction Fuselage—metal panels over tubular framework forward of main fuel tank (between pilot's and observer's cockpits), Alclad-covered light alloy monocoque aft of pilot's cockpit. Stub-planes—two spars passing through fuselage, Alclad-covered; inward-retracting main undercarriage attached to outboard ends of forward spar. Outboard mainplanes—built up on two T-section Hinduminium girder spars reinforced with steel laminations and sheet steel webs, Alclad-covered; mainplane folding hinge at rear spar of stub and mainplane. Fin and tailplane—two spars with Duraluminium sheet ribs. Control surfaces—metal framed with fabric covering, with the exception of the lower portion of the rudder, which formed the tail cone, Alclad-covered.

PARTICULARS

Dimensions
Fairey P.4/34 (K7555)
Span: 47 ft 4½ in
Length: 40 ft
Height: 14 ft 1 in (tail-up)
Wing area: 377 sq ft

0.8/38 Specification
Span: 46 ft—18 ft maximum folded
Length: 40 ft
Height: 15 ft (tail down)

Fulmar I and II
Span: 46 ft 4½ in
Length: 40 ft 2 in
Height: 11 ft 6 in (tail down, over propeller)
Wing area: 342 sq ft

Powerplant
P.4/34
Rolls-Royce Merlin II rated at 1,030 h.p. at 16,000 feet at 2,850 r.p.m. and +4 lb (38-inch Hg) manifold pressure (boost).

0.8/38 and Fulmar I
Rolls-Royce Merlin VIII rated at 1,080 h.p. from sea-level to 1,000 feet at 3,000 r.p.m. and +9 lb boost (normal for take-off, combat emergency); 1,035 h.p. at 7,750 feet at 3,000 r.p.m. and +4 lb boost (5 minute limit power).

Fulmar II
Rolls-Royce Merlin 30 rated at 1,300 h.p. from sea-level to 1,000 feet at 3,000 r.p.m. and +12½ lb boost (normal for take-off, combat emergency); 1,260 h.p. at 7,250 feet at 3,000 r.p.m. and +9¾ lb boost (5 minute limit power).

Weights
P.4/34
Maximum Loaded: 8,787 lb

0.8/38 Specification
Maximum Loaded: (i) 8,750 lb as floatplane (February 1938);
(ii) 9,000 lb in any form (April 1938)

Fulmar I
Empty: 8,720 lb
Maximum: 10,700 lb

Fulmar II
Empty: 8,650 lb
Maximum: 'clean' 10,350 lb
60 Imperial gals external tank 10,900 lb

Armament
P.4/34
One fixed, forward-firing 0.303-inch machine-gun.
One 0.303-inch machine-gun on Fairey High-Speed mounting in rear cockpit.
500 lb of bombs.

0.8/38 Specification
8 × 0.303-inch fixed forward-firing machine-guns with minimum of 500 rounds per gun (r.p.g.).
2 × 100-lb Anti-Submarine or 250-lb General Purpose bombs.

Fulmar I
8 × 0.303-inch machine-guns with 750 r.p.g.
8 × 20-lb or 25-lb High Explosive Anti-Personnel (A/P) bombs.
8 × 0.303-inch machine-guns with 1,000 r.p.g.
or
4 × 0.50-inch machine-guns with 370 r.p.g.
8 × 20/25-lb A/P bombs under mainplanes
or
1 × 250-lb or 500-lb Semi-Armour Piercing bomb below fuselage.

Performance
P.4/34
Maximum speed: 284 m.p.h. at approximately 16,000 ft
Range: 850 miles

0.8/38 Specification
Max. speed: 265 m.p.h. at 10,000 ft
Patrol Endurance: 6 hours at 10,000 ft and 138 m.p.h., plus 15 minutes combat at sea-level
Cruising Endurance: 2 hours 45 minutes at maximum economical cruising speed at 10,000 ft, plus 15 minutes combat at sea level.

Fulmar I
Max. speed: 265 m.p.h. at 7,500 ft (new aircraft under test)
230 m.p.h. at sea-level } (aircraft in service)
247 m.p.h. at 9,000 ft }
Maximum diving speed: 450 m.p.h. IAS (Indicated Air Speed)
Patrol Endurance: 4 hours with reserves for combat
Search Radius: 250 statute miles at 10,000 ft at 168 m.p.h.
Time to height: 5,000 ft in 4 mins 20 secs;
10,000 ft in 8 mins;
15,000 ft in 15 mins.
Ceiling: 21,500 ft (under test);
16,000 ft (practical, in service)

Fulmar II
Max. speed: (under test): 266 m.p.h. at 9,600 ft;
(in service): 238 m.p.h. at sea-level;
259 m.p.h. at 9,000 ft;
245 m.p.h. at 15,000 ft.
Patrol Endurance: 5 hours 30 minutes with reserves with 155 Imp gals internal and 60 gals external fuel
Search Radius: 320 miles at 174 m.p.h. at 10,000 ft with 215 gals fuel
Strike Radius: 220 miles with 1 × 500-lb bomb and 155 gals fuel.
Time to height: 5,000 ft in 3 mins 15 secs;
10,000 ft in 7 mins 10 secs;
15,000 ft in 12 mins.
Ceiling: (under test): 23,900 ft
(practical): 16,000 ft

PRODUCTION

Fairey Aviation, Heaton Chapel (Stockport)

Fulmar Mark I (Development—Merlin RM3M)
N1854, N1858.

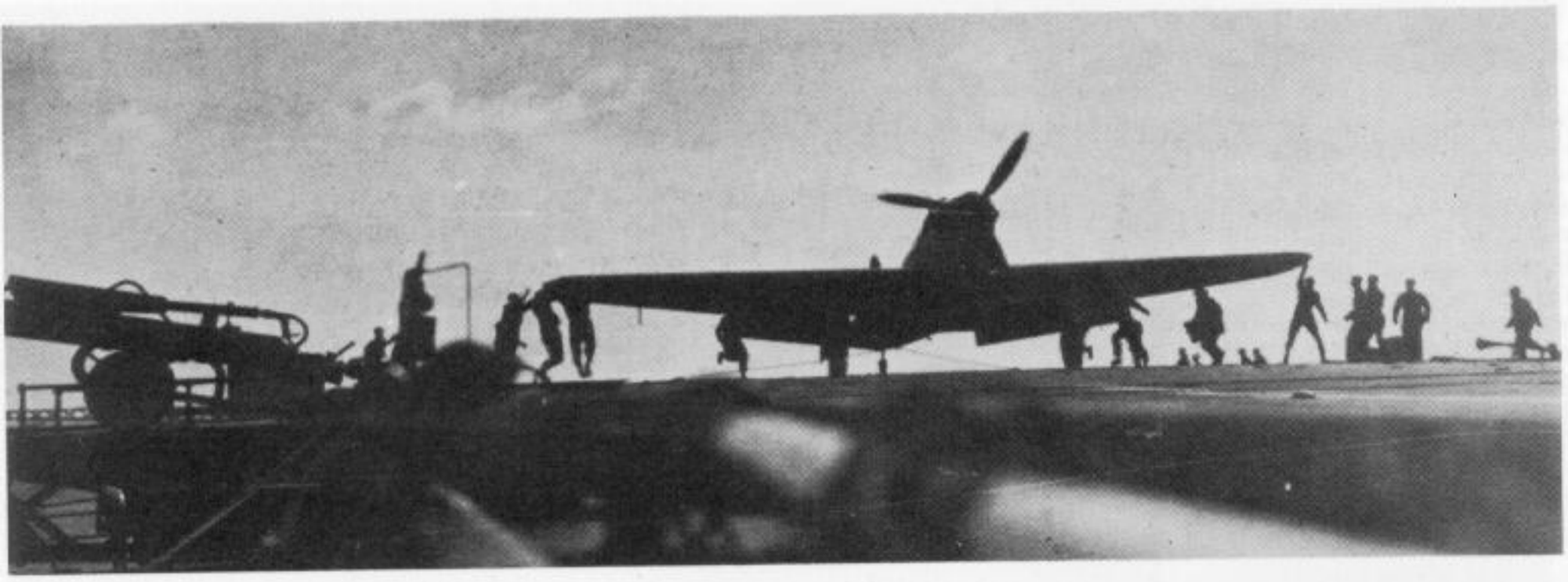
Fulmar I (Merlin VIII)
N1855–N1857, N1859–N1893, N1910–N1959, N1980–N2016, N3994–N4016, N4017–N4020, (see text for early Mark II production status).

Fulmar II (Merlin 30)
N4021–N4043, N4060–N4100, N4116–N4147, X8525–X8574, X8611–X8655, X8680–X8714, X8729–X8778, X8798–X8817, BP775–BP796, BP812–BP839, DR633–DR682, DR700–DR749.

Fulmar II
Secured and tensioned on the accelerator, a Fulmar of 809 Squadron gets the green flag – an executive signal to the engineers to fire the catapult and an advisory signal to the pilot that it's too late to change his mind. The background is Seidisfjord, Iceland.
(Photo: IWM, ref. A7529)

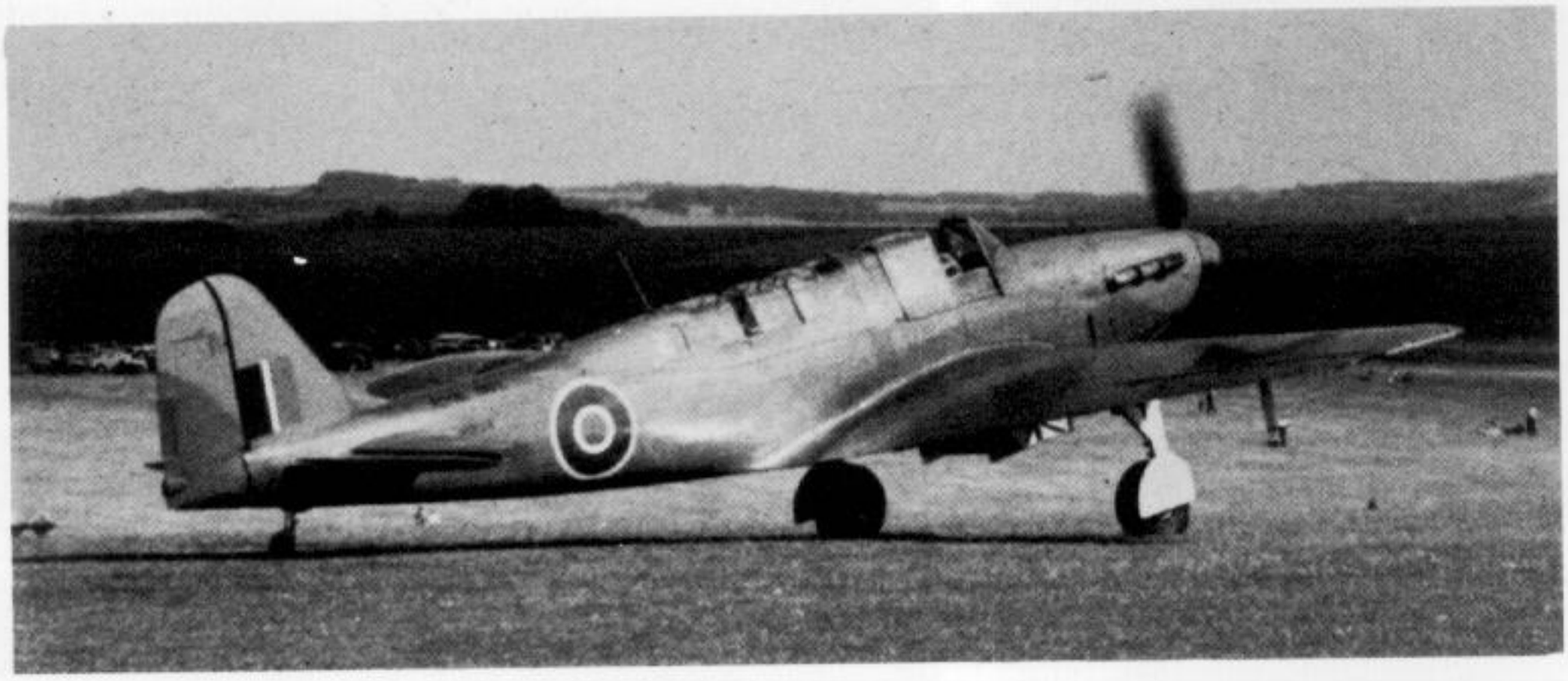
3 *Two armourers and a Sub Lieutenant (Air) RNVR examine B VI Z 0.303 in incendiary ammunition being loaded into the inboard ammunition boxes of an 809 Fulmar. The breeches of the two outboard guns and the feed track to one of the inboard guns are clearly visible beneath the folded flap, as are the two outboard feed tracks in the small opening. Note that an 'A'-form system of bracing is used in the construction of the gun bay area as conventional ribbing would interfere with the ease of access to the four tightly-packed guns.*
(Photo: IWM, ref. A7649)

4 *Another photograph of N1952, seen taking off from* Pretoria Castle *in May 1944, while serving with 778B Squadron, which used this venerable Fulmar I for radar and radio calibration and as a communications aircraft – carrying up to three passengersin the rear cockpit.*
(Photo: IWM, ref. A23562)

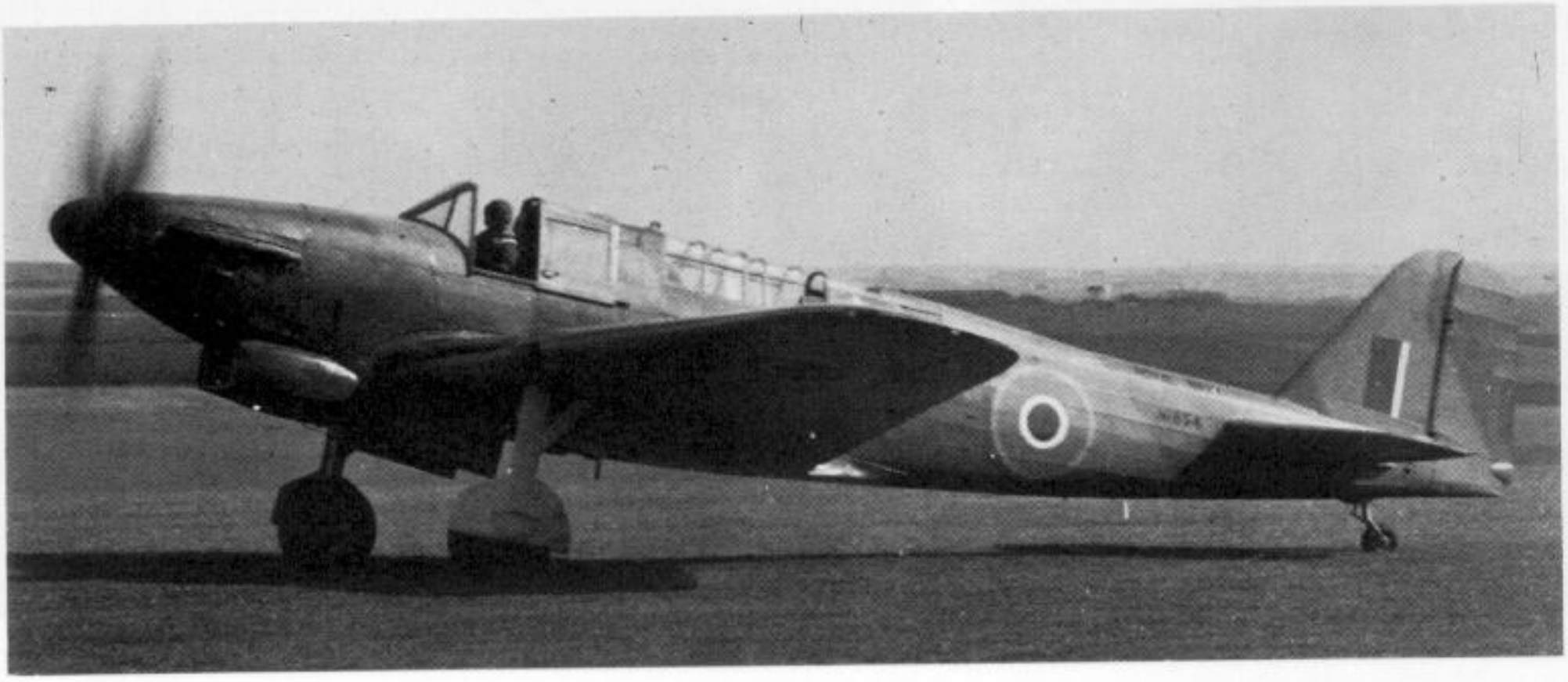


The camera freezes Argus' flight deck party into immobility in a scene of considerable activity as a Fulmar rolls to a halt in the wires.
(Photo: via C. J. Wood)

Alias N1854: The prototype was modified to Fulmar II engine standards during the War, civilianized at Heaton Chapel in 1946, granted a civilian Certificate of Airworthiness in February 1947, and used by Fairey Aviation as a 'hack' until 1959.
(Photo: Charles W. Cain)



The prototype was a frequent visitor to air displays during the post-war years, both as G-AIBE (seen at the Daily Express '50 Years of Flying' display at RAF Hendon in 1951), and as N1854 – at RAF Upavon during its last 'season' in 1962. Later in the year, the Fulmar was presented to the Royal Navy, who kept it at RNAS Lossiemouth (HMS Fulmar), Morayshire, until 1972, when it was transferred to the 'Fleet Air Arm Museum' at RNAS Yeovilton.
(Photo: Charles W. Cain)



Series Editor:
CHARLES W. CAIN