RANDOM HOUSE eBOOKS

Test Pilot

Brian Johnson

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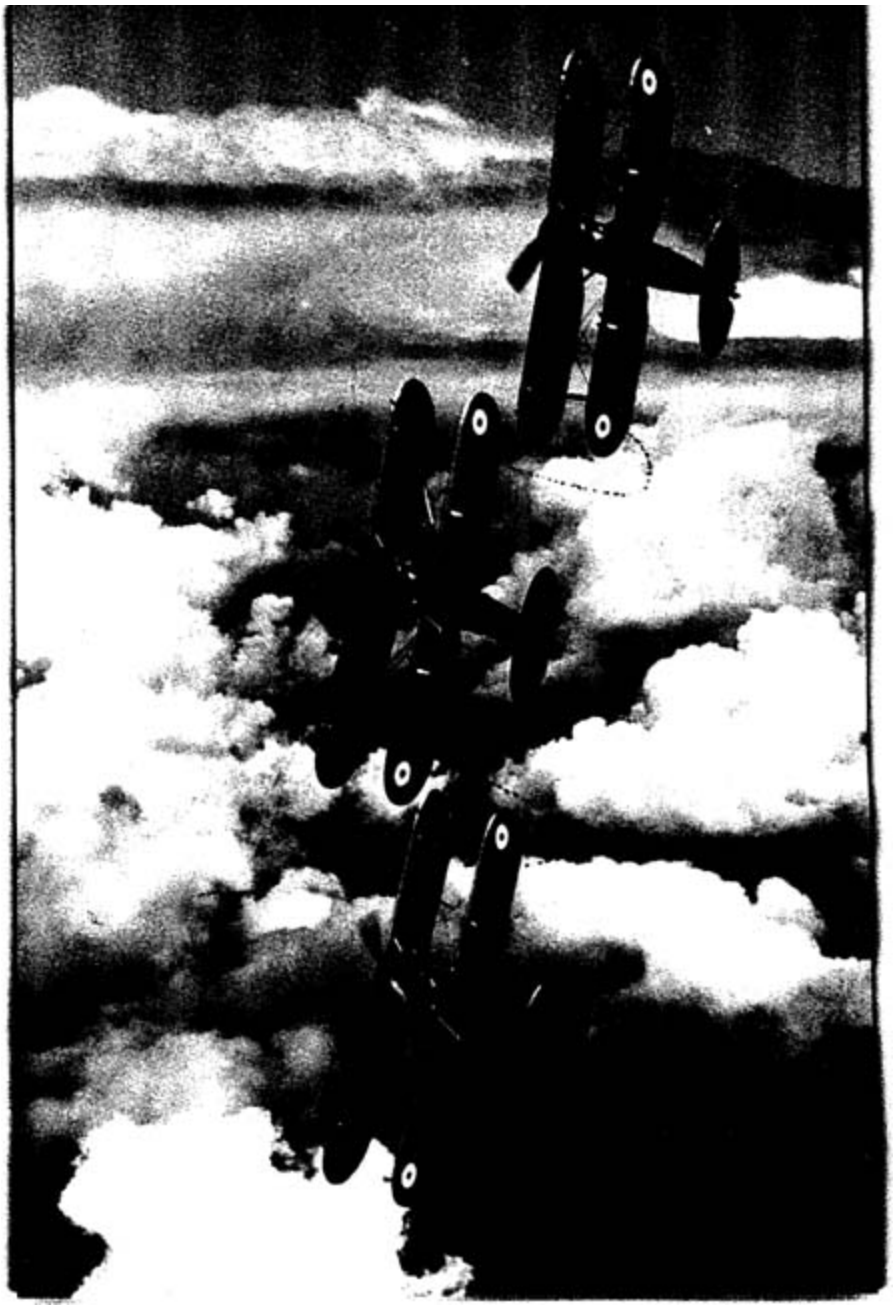


There is no doubt that the flying standards of the RAF in the inter-war years were of the highest, as epitomised by these Gloster Gladiators of No. 87 Squadron, up from Debden in the summer of 1938 to practise close formation aerobatics with the aircraft tied together by elastic ropes (*Rolls-Royce*)

Also by Brian Johnson

The Secret War

A Most Secret Place, Boscombe Down 1939–45
(with T. Heffernan)

Bombers
(with H. I. Cozens)

Fly Navy: A History of Naval Aviation

TEST PILOT

Brian Johnson

BBC Publications

For the staff and students
of Fixed Wing Course No. 44
and Rotary Wing Course No. 23
of the Empire Test Pilots'
School, Boscombe Down

1 Boscombe Down

> *To design a Flying Machine is nothing;*
> *To build it is not much;*
> *To test it is everything.*
> Otto Lilienthal (1848–1896)

Boscombe Down, a large airfield on the chalk uplands of Salisbury Plain, is the base of The Aeroplane and Armament Experimental Establishment (A&AEE). It is run by the Ministry of Defence Procurement Executive. The basic remit of the establishment, which works in close collaboration with the Royal Aircraft Establishment at Farnborough and Bedford, is to assess military aircraft in their intended role as weapons of war. To this end it tests not only the actual aircraft but also a wide range of airborne weapons, equipment and electronics, including exceedingly highly classified radars and navigation systems: it goes without saying that Boscombe Down is, and always has been, a withdrawn and Prohibited Place.

The title A&AEE was granted officially as long ago as 1924, at a time when the nascent Royal Air Force was fighting for its continued existence: the Navy and the Army considered the RAF as a wartime expedient and wanted their individual Air Corps returned to their command. (The RAF had been formed from the Royal Flying Corps and the Royal Naval Air Service in 1918, the exact date, 1 April, being considered by many as significant.) Owing to the skilled lobbying of Lord Trenchard, the concept of an Independent Air Force was eventually recognised and allowed to flower, on it must be said distinctly stony ground: what at the end of the Great War had been the largest and

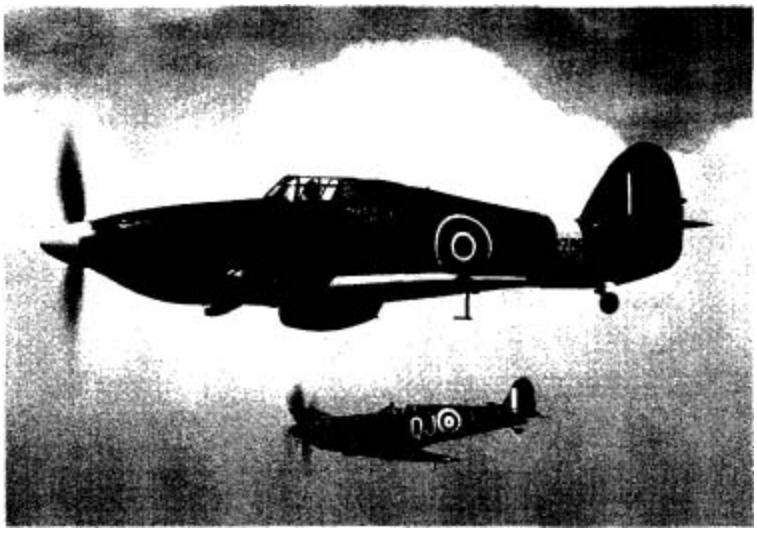
only Independent Air Force in the world with no fewer than 22,647 aircraft formed into 188 squadrons at home and overseas, had by 1923, in the post-war atmosphere of disarmament and retrenchment, shrunk to a mere ten squadrons composed almost exclusively of wartime aircraft. However, it remains true that in 1923 a committee under Lord Salisbury had proposed a ‘Fifty-two Squadron Plan’ of some 600 aircraft for Home Defence.

The Empire Test Pilots’ School returned to Boscombe Down in 1968 where it has since remained (*B. Johnson*)

The Salisbury Report had been accepted by a reluctant government under Stanley Baldwin and a modest start to the expansion of the RAF began with new designs at last being ordered, albeit in very small numbers. The parsimony of the inter-war governments had one unforeseen benefit: if the RAF was to be small, Trenchard was determined that it would be of the highest quality possible, both in men and machines.

Desperate manufacturers, who had seen orders drop from 3500 machines a month to virtually zero at the war’s end, submitted their spindly biplanes to the newly named A&AEE for Service Acceptance Trials on that Establishment’s airfield at Martlesham Heath, a desolate windswept site surrounded by marshes and saltings on the east coast of Suffolk, near Woodbridge. The A&AEE had a small staff of test pilots to

investigate the tendered machines and to report on their suitability or otherwise for the slowly expanding squadrons of the RAF. The test pilots were in the main drawn from the ranks of the service; at that time they would, to a man, have had operational experience during the late war, some no doubt as squadron commanders but glad to have dropped rank to fly as Flight Lieutenants in the post-war Air Force. The system of recruiting test pilots from RAF squadrons was to continue at Martlesham Heath until the outbreak of the Second World War. It had served well enough: until the advent of the new monoplanes, service aircraft of the 1930s were simple and undemanding machines with, as perceived by the Air Staff, simple and undemanding roles. In effect, the test pilots and their aircraft developed together. By the mid-1930s when new, high-performance monoplanes appeared – both the Spitfire and the Hurricane were accepted after testing at Martlesham Heath by the A&AEE – the test pilots, in many cases guided by those of the manufacturers, had acquired the skills required to evaluate them. The number of prototypes tested, even during the panic expansion years of the late 1930s when the German *Luftwaffe* was emerging as a very serious challenge to the RAF, was still low enough for new test pilots to be trained ‘on the job’ on a master/pupil basis.



The prototype Hurricane and Spitfire were both test flown by A&AEE test pilots at Martlesham Heath. The Hurricane depicted, PZ 865, a IIc, was the last of some 14,000 built between 1936 and 1945. The Spitfire V, AB 910, was constructed in 1941, one of a total of 20,351 Spitfires. (*British Aerospace*)

The RAF has always been rightly proud of its standards and in the inter-war years, when the depression had made even white-collar jobs difficult to find, there was no shortage of young fit men eager to be paid, however inadequately, to fly high-performance aircraft. The RAF could, therefore, afford to pick and choose: to train only the most able and then to the highest possible standards. After a tour or two with operational squadrons those who had their log books endorsed ‘Above average’ or the extremely rare ‘Exceptional’ might well be invited to become test pilots with the Royal Aircraft Establishment at Farnborough or the A&AEE at Martlesham Heath.

K5054, the first Spitfire, being test flown in 1936. When it arrived at Martlesham Heath for Service acceptance trials, it represented a giant step forward from the fabric-covered Gloster Gladiators which were then the RAF’s front line fighters. (*Aeroplane*)

The 1930s were ‘The best of times, the worst of times’, for the wooden, fabric-covered biplanes powered by engines in the 600 hp class were being supplanted by stressed skin

monoplanes with 1000 hp engines. Stressing of those aircraft was at that time still to a great extent empirical and several firms submitted advanced prototypes which their test pilots found to be deficient in a number of vital ways. It was not unknown in that unenlightened age for a test pilot, on landing his disintegrating charge, to settle a fine point of design detail with the head of the Stress Office behind the nearest hangar.

The expansion of the RAF accelerated as the last years of peace dwindled and the number of aircraft requiring 'Service Acceptance' increased: there was still no shortage of young men eager to fly them, whatever the risks involved. The last words of Otto Lilienthal, one of the first pilots to die testing a prototype, were prophetic: '*Opfer müssen gebracht werden*' (Sacrifices must be made). When the Munich crisis came in September 1938, despite Neville Chamberlain's 'Peace in our time' assurances, it was realised that the isolated site at Martlesham Heath, selected in 1924 to keep prying eyes away from the aircraft being tested there, was in fact just about the nearest point of the British Isles to Germany, and presented a target of which bomber crews dream.

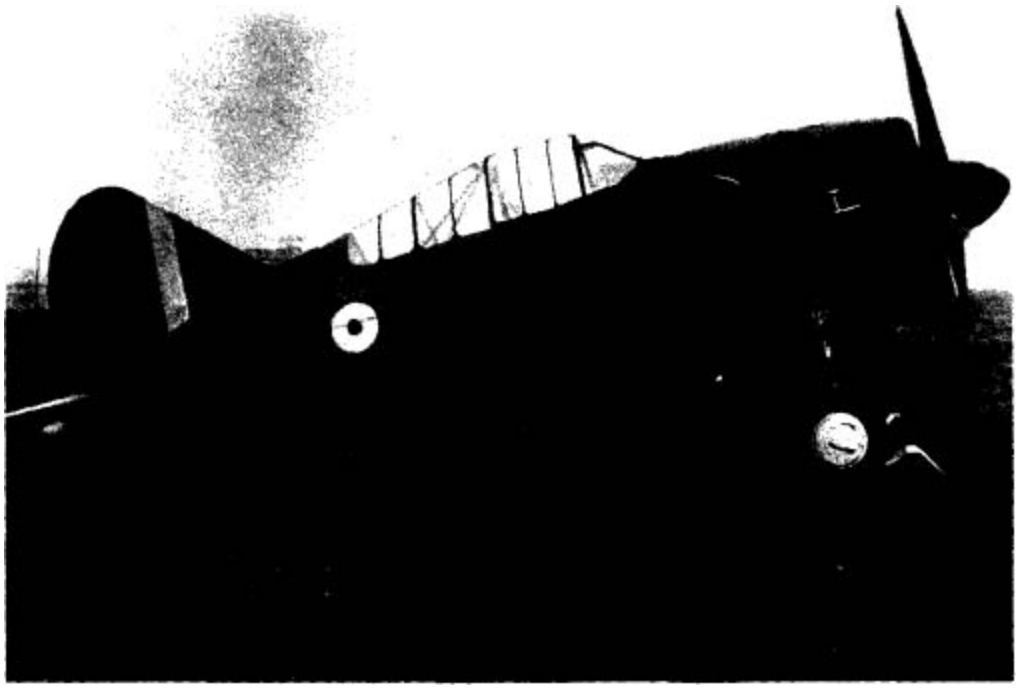
Britain declared war on Germany a year later on 3 September 1939; by that time the plans to move the A&AEE, lock, stock and barrel, to a safer location had been finalised. In passing, it is interesting to note that for some years between the wars, official thinking in Whitehall had considered that Britain's only potential enemy was the old one: France. As a consequence many RAF airfields were located in the south of the country; one of them, Boscombe Down, was selected for the A&AEE. The idea that France would fall and place those southern airfields within *Luftwaffe* fighter and bomber range was never given any serious consideration; so the move – on 3 September – was made and the A&AEE settled into the base on which it is still to be found.

The winter of 1939–40 was one of the coldest on record; the two bomber squadrons that had been in residence, Nos 88 and 218, must have been glad to exchange the frozen airfield for their operational bases in France to fly the largely pointless sorties of the ‘Phoney War’. Tragically, when that phase ended with the German Blitzkrieg which was unleashed on the hapless French Army and the British Expeditionary Force on 10 May 1940, those two squadrons, together with No. 12, all flying their outclassed Fairey Battle bombers, would suffer the highest loss rate to be sustained by any unit of the RAF in Europe.

After the departure of the Battles, another unit, No. 58 Squadron, Coastal Command, was based on Boscombe Down for a short time during the worst of that first bitter winter of the war. The squadron was to fly convoy protection patrols over the Western Approaches but most of the time their sixteen Whitleys, dispersed on the open airfield, were simply frozen to the ground. After the bombers had been prised free, the coastal squadron departed and Boscombe Down ceased to be an operational airfield, becoming exclusively the province of the Ministry of Aircraft Production and their clients, the A&AEE. The tempo of test flying was soon to increase to a level unthinkable to old Martlesham Heath hands. Aircraft of all descriptions were being delivered from the new Shadow factories operated by the motor car industry; many of the aircraft being built had been ordered straight from the drawing board and showed it: most were constructed by a hastily trained workforce with a predominance of females who had never even seen an aircraft close to, much less helped to build one. Many of the men in the wartime factories were either unfit or too old for military service; the hours were long and the work for the most part dull and repetitive; there was a strictly enforced total blackout; from 1940 air raids disrupted production. All things considered, it is hardly surprising that among the many aircraft that came to Boscombe Down for testing,

some were found to suffer from poor workmanship. All the aircraft entering service in the early years of the war were designed in the late 1930s, and the roles that they would have to fulfil would in many cases change radically; a number, like the ill-fated Fairey Battles, would be obsolete before they even saw action. Many aircraft were ordered without any clear idea as to how they could be used operationally. This was especially true of the machines bought (for hard cash) from the United States in the early days of the war. A substantial number of American aircraft arrived in England as a result of Britain taking over orders that had been placed by the French and Belgian governments before the occupation of those countries. In some cases – the Brewster Buffalo comes to mind – the Allied cause would possibly have been better served had the aircraft been delivered, as originally intended, to the quays of Antwerp or Brest to fall into the hands of the enemy. From whatever source, representative examples of the many aircraft ordered arrived at Boscombe Down to be tested and deemed fit or otherwise for service.

A Bristol Bombay. This Bomber/Transport represents the half-way stage between the lumbering biplanes of the 1930s and the later heavy bombers of the war years. L5808 was the first production aircraft, photographed in March 1939 at Short & Harland's, Belfast. (*Rolls-Royce*)



This Brewster Buffalo I was one of a cancelled Belgian contract for twenty-eight aircraft. AS 412 was photographed at Boscombe Down in 1940, during its handling trials. These did not proceed very far, however, since the aircraft suffered engine failure on take-off at an early stage and the type was reported as unsatisfactory. (*MoD/Crown*)

The workload on the Performance Testing Flights at Boscombe Down was very high; some idea can be gauged from the 'Aircraft on Charge' returns. In September 1939, just after the move from Martlesham Heath, the records show that the Performance Testing ('Per T') Squadron contained three flights: 'A' Flight, concerned with the testing of fighters had fourteen machines on charge; 'B' Flight, responsible for heavy bombers (in fact the heaviest were twin-engined Wellingtons), had eleven aircraft; 'C' Flight, testing naval aircraft, had eleven machines on charge. The second test squadron at Boscombe, Armament Testing ('Arm T'), consisted of two flights: 'A' Flight tested fighter armament and had fourteen aircraft (including, rather surprisingly, a Tiger Moth); 'B Arm T' Flight boasted fourteen. This gave a total of sixty-four aircraft. The returns of 'Aircraft on Charge' at Boscombe Down for May 1945 give

a clear picture of the growth of flight testing during the war years; no fewer than 186 aircraft of all types (the figure includes 23 with ETPS though some of those, as today, were probably shared with the test squadrons).

The Performance Testing flights of 1939 had, by 1945, become full squadrons: ‘A’ squadron with two flights testing forty modern fighters’; ‘B’ squadron, again with two flights working on twenty-four bombers, all four-engined; ‘C’ squadron, was responsible for the testing of twenty-three assorted naval aircraft. There was also ‘D’ squadron with two flights of medium bombers, mainly used in the flight testing of airborne radar and radio equipment and navigation and bombing aids on behalf of the Telecommunication Research Establishment (TRE) and a Communications and Special Duties Flight. Finally, there was the Intensive Flying Development Flight (IFDF), whose aircraft included a Lincoln Bomber and six Tempest fighters. The number of skilled test pilots and, in the case of the multi-place aircraft, aircrew required to test such a large number of aircraft must have been formidable indeed. These figures only apply to Boscombe Down; service test pilots were also working at Farnborough and the Airborne Forces Experimental Establishment at Beaulieu. Military test pilots were also seconded to the aero engine companies and the aircraft factories for prototype and production testing, where their recent operational experience proved invaluable.

Once the Germans had defeated Poland, Belgium and France so easily, by the aggressive use of airpower brilliantly integrated with fast armour on the ground, it was obvious, even to the most obtuse of Whitehall Warriors, that the Second World War was, unlike the First, to be a conflict in which the key to success would be airpower. Without massive support from the air, no battle, whether on land or sea, could be hoped to be won. The Battle of Britain, fought during the long hot summer of 1940, was a watershed for

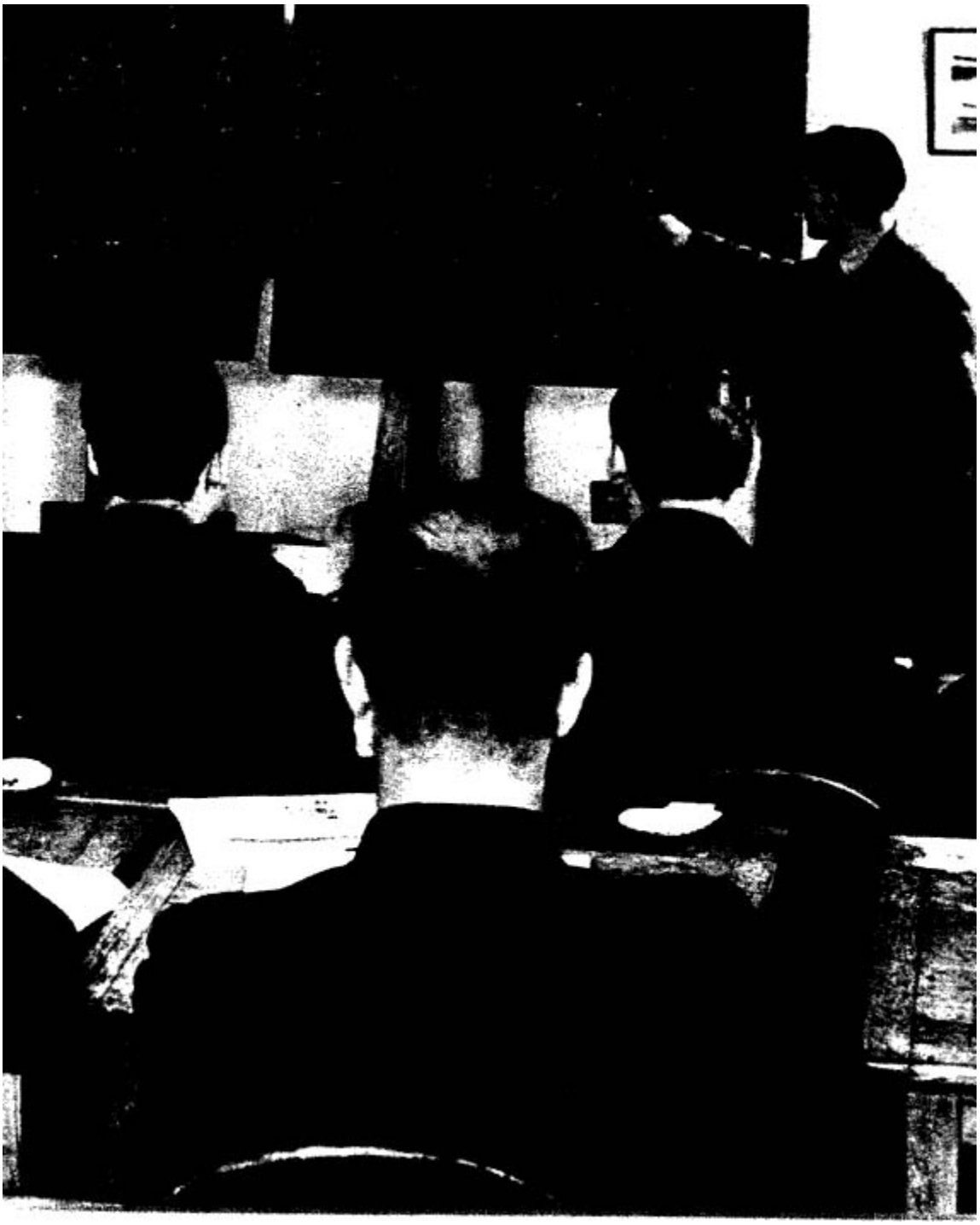
the RAF. The warnings of a few prescient men during the last years of peace were proved true: the far-sighted provision of a radar-based ground control system, the excellent Spitfire and Hurricane fighters and, not to be forgotten, the fruits of Trenchard's insistence on the highest standards of training, undoubtedly saved the country from almost certain defeat – by a narrow margin indeed. However, fighters are defensive. When the Air Staff had succeeded in disabusing the politicians of the idea that German factories, even if engaged in war production, were private property and therefore immune from attack, Bomber Command, instead of dropping tons of useless paper in the form of leaflets, turned to the offensive against Germany. It very soon became clear that aircraft performance, tactics, even in certain respects the training of aircrew (navigators in particular), required urgent revision. The rethinking of the Air Staff resulted in an unprecedented flood of new and replacement aircraft of all types. (During the war years, the RAF had placed on charge no fewer than 55,000 aircraft, serving 487 squadrons. Of that total 22,000 aircraft were lost or damaged beyond repair.)

FR 409, a North American Mustang V, photographed at Boscombe Down during handling trials in the autumn of 1944. The hangar by the aircraft's propeller is the one used by the ETPS Flying Wing today. The building by the fin is the Officers' Mess. (*MoD/Crown*)

When it is considered that all the many aircraft types that entered service with the RAF and the Fleet Air Arm – and a

good many that did not – were the subject of extensive trials by the A&AEE at Boscombe Down and the other related Establishments, it is apparent that the provision of an adequate number of trained test pilots would soon become a matter of major concern. The system of ‘learning on the job’, inherited from a more leisurely era at Martlesham Heath, was proving inadequate. From the end of 1941 there was no shortage of available men ‘resting from operations’ after the air war began to be fought in earnest; but even above average, operationally experienced pilots posted to Boscombe Down and elsewhere who had an interest in test flying could not be used straight away on a test programme. It was found that practically all required at least a year of training with the test squadrons before they could make a significant contribution to the work in hand. It is one thing to know that an aircraft is difficult to control; it is quite another to be able to write a reasoned report as to *why.* It was not a question of flying skills: to be able to put a prototype fighter into an inverted spin, and then calmly note on a knee-pad the several parameters of the machine’s gyrations, calls for rather special abilities which can be acquired only by specialised training. In fact, it was discovered that pilots with ‘Exceptional’ flying endorsements often did not make suitable candidates for test flying; their skills were such that they could take up the most ill-designed aircraft and have little difficulty in flying it, making a subsequent satisfactory report. In contrast, a trained test pilot would, on flying a deficient machine, say to himself, ‘I can fly this heap, but is it reasonable to assume that an average squadron pilot with perhaps as little as 200 hours’ total time, frightened, tired and perhaps wounded, would be able to cope?’ Test pilots of military aircraft also have to consider the effect of combat damage; would that bomber get home on one engine? Could this fighter be safely ditched or survive total hydraulic failure when flown by a relatively inexperienced pilot?

By the end of 1942 the workload at Boscombe Down had become critical: apart from the new types from British factories and the constant modification programmes to existing aircraft, American types ordered under the provisions of Lend Lease in 1941 were arriving in large numbers. To try to alleviate the shortage of test pilots, the Commandant of the A&AEE, Air Commodore D'Arcy Grieg (who is best remembered as a member of the RAF's High Speed Flight which won the Schneider Trophy) was asked by a former Commandant of the A&AEE, Air Marshal Sir Ralph Sorley, then Controller of Research and Development, Ministry of Aircraft Production (on behalf of which the A&AEE operated), to set up a test pilots' school at Boscombe Down. The terms of reference were 'to provide suitably trained pilots for test flying duties in aeronautical research and development establishments within the service and the industry'. It was a substantial remit for which there was no precedent: such a school would be unique for, at that time, no other existed anywhere in the world.



G. Maclaren Humphreys lecturing in the Ground School to students of No. 7 ETPS course in 1948. This was the first course to be held at Farnborough where ETPS was to remain until 1968, when it returned to Boscombe Down (*A&AEE/Crown*)

2 ETPS

‘Why,’ said the Dodo,
‘The best way to explain it
Is to do it.’
LEWIS CARROLL, *Alice in Wonderland*

To say that the prospect of a school for test pilots set the hard-pressed Performance Testing squadrons alight would be wide of the mark; many of the staff at the A&AEE had considerable reservations about the feasibility of training test pilots in a school. If Air Commodore D’Arcy Grieg agreed with those sentiments he did not show it; he sent for two key men: G. Maclaren Humphreys, a physicist civilian A&AEE Technical officer, whom he appointed chief (and sole) ground instructor, and Wing Commander Charles Slee, the CO of ‘B’ Flight (B Per T) Boscombe Down, who was offered the command of the proposed school. Both men were very keen on the idea of the new school and pleased with their appointment.

There was, however, a snag. They had previously been working together on a project which had become urgent: the clearing for service of the third prototype Avro York transport, LV663, which was required for the King’s Flight. The aircraft had been fitted out to a high degree of luxury by austere British wartime standards. Since the three Yorks had been constructed without official sanction, using a large percentage of Lancaster bomber components, a good deal of work was involved to ensure LV663 was suitable for the King’s Flight. The A&AEE acceptance trials were conducted between 30 April and 14 May 1943 and the test team, including the entire staff elect of the proposed test pilots’

school, flew in the VIP York, now rather grandly named *Ascalon*, on no fewer than sixteen test flights from Boscombe Down. Fortunately, Wing Commander Slee and Maclaren Humphreys had previously spent a long time drafting a syllabus for the test pilots' course. The final test flight of the York was made, and it flew from Boscombe Down on 25 May to join No. 24 Squadron at Northolt, piloted by Wing Commander Slee who was to brief the York's prospective squadron crew on the new aircraft. Exactly what next happened is now a matter of speculation; suffice to say Wing Commander Slee remained with *Ascalon* to pilot HM King George VI on an extended tour of the North African front.

LV 633, *Ascalon*, the Avro York which was tested at Boscombe Down prior to joining the King's Flight to be used by H M King George VI and Winston Churchill. (*MoD/Crown*)

Having lost the CO of the school three weeks before it was due to open, there was little time to select a replacement; the original had been obtained from 'B' Flight, therefore Air Commodore D'Arcy Grieg sent for the CO of 'A' Flight, Squadron Leader 'Sammy' Wroath, and offered him command of the test pilots' school. He was not at all keen on the prospect, being happy at 'A Per T', and wanted to continue as the CO. After the urgency of the situation had been explained to him, he thought about it for a moment and then said to his commandant, 'Well, sir, I am not about

to volunteer for the job, but if ordered to do it of course I will.' He was and did.

Sammy Wroath was a remarkable man; he had joined the RAF as an aircraft apprentice at Halton in 1925, one of the first of Trenchard's 'Brats', as they were known in the pre-war Air Force. Although Halton apprentices were trained primarily as tradesmen, a few, including Sammy Wroath, were selected to become pilots. He must have been a very good one for he later became the first sergeant pilot to undertake test flying at Martlesham Heath. At Boscombe Down he had risen to the rank of Squadron Leader and, on becoming the first CO of the still unnamed school, was promoted Wing Commander.

Sammy Wroath and Maclaren Humphreys took possession of a group of buildings situated on the south side of the airfield. Whether by accident or design, the school location was just about as far away from all the other A&AEE activities as was possible. The buildings were not ideal: they consisted of two Seco wooden huts, four Nissen huts, without which any wartime military accommodation was seemingly unthinkable, and, to look after the physical well-being of the staff and students, a brick-built washhouse adjacent to an air raid shelter. The latter was a most important consideration in early 1943, for the airfield had been bombed, though not heavily, in 1941–2, usually from single 'Tip and Run' Ju88s. (As it was to turn out, the only enemy aircraft to visit Boscombe Down from the beginning of 1943 to the end of the war were those which had been captured and sent there for evaluation.)

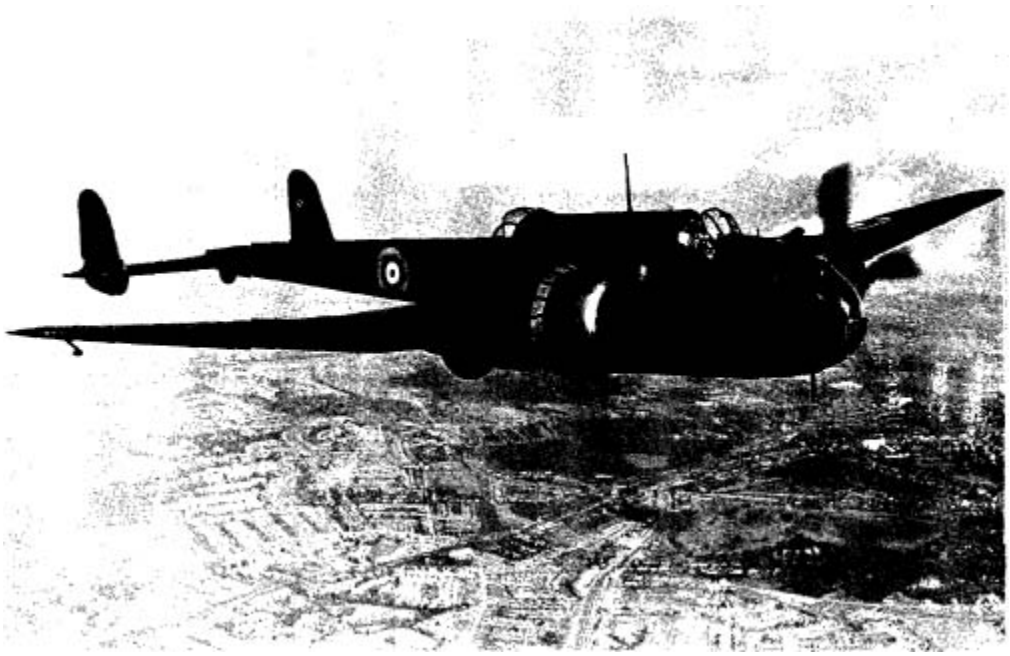
‘Hazel’ Hazelden in 1943 when he was a student on the first test pilots’ course at Boscombe Down (*A&AEE/Crown*)

Sitting in the new and empty buildings, the two men set about finalising the syllabus for the first test pilots’ course. All they had to go on was the already quoted terms of reference and the daunting thought that the students, on completion of the eight-month course, would be expected to be able to join a test programme without any further training. A timetable of lectures and flying exercises was prepared: arrangements were made for the students to make visits to the principal aircraft and engine manufacturers: school aircraft were wrested from Maintenance Units and COs in Home Commands of the RAF and the FAA were asked to nominate suitable candidates to apply for a place in what was simply called ‘The Test Pilots’ School’.

The ETPS buildings at Boscombe Down, probably at the time of the second course (1944). The aircraft visible include Harvards and various Spitfires. Though ramshackle to modern eyes, the accommodation was generous by wartime standards. (*A&AEE/Crown*)

Among the eighteen candidates selected from the many nominated was a twenty-eight-year-old bomber pilot, Squadron Leader Hedley G. Hazelden, DFC and Bar. ('Hazel', as he is universally known, was to prove a good choice: he completed the course, eventually became CO of 'B Per T' and, after the war, the Chief Test Pilot of the Handley Page Company, testing, among other aircraft, the prototype HP Victor jet bomber.) Hazel reported to the Test Pilots' School on 19 June 1943. In a recent conversation with the author he admitted he was lucky to be there at all; he had joined the RAF Volunteer Reserve and learned to fly in the crisis year of 1939, just in time to be mobilised on 2 September, the day before Britain entered the war with Nazi Germany. He survived flying Hampdens with No. 44 Squadron, including a crash landing in fog at Boscombe Down on the night of 20 March 1941 when returning from a mine-laying operation off St Nazaire (his first, informal, visit to the A&AEE base). On the completion of a full operational tour in April 1941, he was awarded a DFC. After a 'rest', instructing

on war-weary Hampdens at No. 14 Operational Training Unit (OTU), Cottesmore, his next operational posting was to No. 83 Squadron, operating the ill-fated Avro Manchesters, powered by two 24-cylinder Vulture engines; one of the few unsatisfactory powerplants produced by Rolls-Royce. This advanced engine was far from reliable and as many Manchesters were lost due to engine failure as to enemy action. Following an engine fire, Hazel brought his back from Germany on one. He received a Bar to his DFC for that. (Many Manchester pilots considered that DFCs should be awarded for simply getting back.) Hazel was particularly keen to return from a raid on the night of 8–9 March on the Krupps works at Essen as he was to marry the next day. He made it on time. Returning from his week's honeymoon, he found that the squadron had been severely hit: seven crews lost in three nights. The mounting losses and the increasing doubts about the Manchester, officially conceded after the war as 'disappointing', resulted in No. 83 Squadron being withdrawn from Bomber Command's Order of Battle, pending re-equipping with Lancasters. (These were revised Manchesters powered by four Rolls-Royce Merlins. The first operation by No. 83 Squadron with their new Lancasters was the '1000 Bomber' raid on Cologne on the night of 31 May to 1 April 1942.)



L4032, the first production Handley Page Hampden, flown by Major Cordes, the company's Chief Test Pilot, in 1937. The Major is having some trouble in flying slowly enough for the camera aircraft and has had to open the cowl gills of the two Bristol Pegasus radials to keep the cylinder head temperatures within limits. (*Rolls-Royce*)

Hazel completed his second tour flying Lancasters with No. 83 Squadron, including the big Cologne raid, with another sortie deploying over 1000 bombers, this time on Bremen on 25 June 1942. He was again posted to an OTU for a 'rest', on this occasion to No. 11 at Westcott in Buckinghamshire, where he was senior instructor (on Wellingtons) at the satellite airfield at Oakley. He caused his CO, Group Captain R. W. P. Collings, so much trouble with his constant applications for a posting back to an operational unit that, when the order to nominate experienced pilots for the Test Pilots' School at Boscombe Down was received at Westcott, it was seen as a heaven-sent opportunity.

Hazel duly arrived at Boscombe Down. He soon discovered on meeting his fellow students that all seemed to have one trait in common: all were very capable pilots who had completed operational tours, yet strangely all had COs prepared to 'let them go', some with almost indecent

haste. ‘Mavericks’ was the word Hazel used to describe his companions on the course. Hazel remembers that he was not really all that fit to begin the exacting course; he had an arm in a sling and had to walk with the aid of a stick because just before leaving Oakley he had fallen off a motorcycle, injuring his right leg, and then had fallen out of a Wellington, which fortunately was on the ground at the time, injuring an elbow.

The course of lectures began almost at once and that Achilles heel of the British educational system, the deficient teaching of mathematics, immediately manifested itself to the extent that, within the first week, no fewer than five of the students departed finding themselves unable to keep up. Hazel had worked for six years in insurance before the war and his maths was adequate; furthermore, D’Arcy Grieg had made an excellent choice in Maclaren Humphreys, who was to become a most popular lecturer. The syllabus which he and Wing Commander Slee had drawn up was to prove not only correct for Course No. 1 in 1943 but was, in essence, the one to be used for the following forty-three to the present day.

The only known photograph of No. 1 Test Pilots' course, taken on a school visit to Filton, the base of the Bristol Aeroplane Company. *Left to right, back row*, Flt Lt K. J. Sewell, Wg Cdr G. V. Fryer, E. A. Swiss (Bristol's), Sqn Ldr M. W. Hartford, Sqn Ldr D. W. Weightman; *middle row*, I. Llewellyn Owen (Bristol's), Sqn Ldr A. K. Cook, Sqn Ldr J. C. Nelson, Flt Lt R. V. Muspratt, Flt Lt J. C. S. Turner; *front row*, Lt Cdr P. H. A. Shea-Simmonds RNVR, Wg Cdr P. H. A Simmonds, Wg Cdr 'Sammy' Wroath (CO of school), A. J. 'Bill' Pegg (Bristol's), Lt Cdr G. R. Callingham RN, G. Maclaren Humphreys, Sqn Ldr H. G. 'Hazel' Hazelden. Wg Cdr P. F. Webster was 'absent flying'. (*A&AEE/MoD*)

When No. 1 course began, the popular image of the test pilot, nurtured to a great extent by Hollywood *circa* 1940, was that of a John Wayne character who socks the chief designer, leaps into the new wonder fighter and, without more ado, zooms away into the bright blue yonder, watched by a tough mechanic buddy who served as a master sergeant with our hero in the most recent war available and who has a heart of gold and a tool kit which consists of one large adjustable spanner and a wad of cotton waste, and of course by an adoring girl-friend whose blonde hair is fetchingly ruffled by the departing aircraft's slipstream. The secret 'pursuit ship' (usually played by a Seversky P-35) is then put through a series of hair-raising aerobatic manoeuvres by the pilot flying with one hand while holding a microphone to provide a running commentary over the radio. The test pilot lands the aircraft after perhaps an engine fire or trifling structural failure and tells the rueful designer how to rectify the minor faults. We then dissolve to the hero and his girl (and his mechanic buddy) as squadrons of new fighters fly away to show the peasants in Europe what real airplanes should be like. Of course that picture was as false in America as it was in Britain – or any industrial country – yet, at the same time, the image of test pilots as hell-raising daredevils persists to some extent. Test piloting is certainly not for the timid but neither is flying in general.

It is difficult to define precisely the qualities that go to make up a good test pilot; the ability to fly with confidence

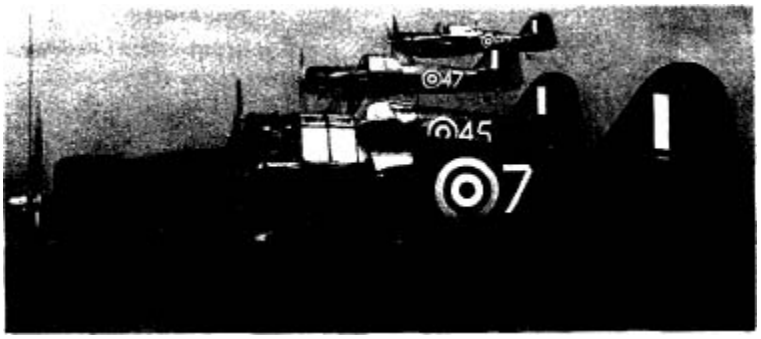
is clearly one essential: to possess what horsemen call ‘good hands’ another; to be what John Farley, a graduate of ETPS and Chief Test Pilot of the Harrier programme, called ‘good stick and rudder men’, in addition to which he added that, ‘A test pilot has always needed to know the theory behind the aeroplane he’s testing, whether it be the aerodynamics of the aeroplane, whether it be the engine principles, the structure or the equipment fit in the aircraft.’ That definition was made by John Farley for the BBC ‘Test Pilot’ series in 1985; it was perfectly relevant in 1943.

The thirteen (eleven RAF and two FAA) students who remained on the first course after the initial week included an American: Squadron Leader J. C. Nelson, who was serving with the ‘Eagle’ Squadron. He was the first of many; there have been very few courses that did not have at least one American attending. The ties between the British Test Pilots’ School and the later American equivalents (particularly that of the US Navy) became and remain very close.

The students were all experienced to the extent that they had flown at least one operational tour. It should be remembered that, at that stage of the war (mid-1943), the chances of pilots surviving a tour were not high, although they did depend on the type of aircraft flown and the operational role of the squadron. A crew flying night bombers, as Hedley Hazelden had, could expect only a one in three chance of completing a thirty-sortie tour. The lowest expectation was among pilots flying Beauforts in an anti-shipping role; the highest was possibly maritime reconnaissance with Coastal Command, although individual crews’ survival prospects following a ditching far out in the North Atlantic were very low. To have survived any operational tour usually implied either exceptional luck or a high degree of flying skill, or a combination of both. That background should be borne in mind when one considers that, by modern airline captains’ standards, the number of hours flown by the wartime students was not all that high.

Hazel had about 1300 hours in his logbook when he arrived at Boscombe Down; he thinks the other bomber pilots on the course would have had about the same; fighter pilots on the other hand would have had a good deal less, they would probably average about 600. It was not the number of hours, it was the quality of the flying experience which counted in those days.

L7245, the second prototype Handley Page Halifax photographed at Boscombe Down in January 1941 during the A&AEE Handling Trials. The aircraft behind the Halifax is a Wellington 1A. (*MoD/Crown*)



Two Miles Master IIIs (W8573 and T8886) were among the aircraft allocated to No. 1 Course. The aircraft illustrated, Master IIIs from an FTS, are displaying A1 roundels which date the photograph to before June 1942. (*Aeroplane*)

Although the course began with ground studies, which covered most aspects of aeronautics, basic aircraft design and control systems, as well as the related subjects of engines, propellers, instruments and the dreaded mathematics, it was essential not only to keep the students