

The third production Vickers Vanguard—G-APEB—photographed during its first flight on 23rd July. This Vanguard is the second of B.E.A.'s twenty on order and is finished in the airline's new colours—red wing, grey, black and white fuselage. Note also the extended dorsal fin.

PREVIEW FARNBOROUGH '59

THIS YEAR'S S.B.A.C. display—the twentieth to be held since the Society of British Aircraft Constructors began the annual presentation of the products of its member companies—is likely to be remembered as marking a period of consolidation for the "streamlined" aircraft industry of this country. Shorn of many military orders by the notorious 1957 White Paper, and limited in its civil market by the multi-milliondollar salesmanship of the Americans, with their government-sponsored finances, the rationalised British industry is showing that despite formidable opposition it is a fertile source of original thinking in aeronautical design, and possesses the engineering know-how to carry these ideas through to completion.

These attributes are reflected in the export record of the industry, which is continually achieving new peaks of overseas sales. Britain has a long tradition as a production centre for foreign air forces of military aircraft, but it is not generally realised that since the war her export potential has been greatly reduced by the restriction of overseas sales to fighters and tactical bombers. This, of course, is because only the Big Three powers-Britain, the U.S.A. and the U.S.S.R.—are able to afford a strategic bombing component, and neither of the two latter countries are prospective customers for the V-bombers, excellent though these are.

We must therefore resign ourselves to seeing few completely new shapes at Farnborough this year, although there are one or two types which have never before been shown in public in this country. There are also several developments of existing designs of some significance, and these will repay detailed study by the discerning enthusiast. Above all, quite literally, there are the superlative test pilots, whose skill, in conjunction with the split-second organisation of the flying programme, go to make the Farnborough display the unrivalled spectacle which it is universally acknowledged to be.

Oddly enough, the undoubted technical highlight of this year's display will not be performing any spectacular flight evolutions, although we can guarantee here and now that it will easily hold the record for a really low-altitude fly-past. Nobody else is likely to dispute the 15 in. which is the maximum operating altitude of the Saunders-Roe S.R.N.I, but a good many people are arguing whether it can be described as an aircraft at all. Salt-encrusted sea captains are swearing good round naval oaths that the Hovercraft is just a glorified boat, but the facts remain that it flies freely through the air powered by an Alvis Leonides aircraft engine, it has been produced by an aircraft company, and is flown by an aircraft (including helicopter) test pilot.

So we shall have the thrill of seeing this novel craft at Farnborough, and to see it

Aeroplane, V.T.O. or boat? Whatever it is, the Saunders-Roe S.R.N.1 will be one of the highlights of the Air Show.



in transition along the runway, even though it may not be possible to see daylight beneath it, so close does it sit, on its cushion of air, to the ground. Nothing more than bicycle speeds, either, may be expected from it in its present configuration, although both its 25-knot speed and operating altitude are to be increased by the addition of another powerplant, for propulsion purposes.

The only rival attraction to the S.R.N.1 in technical interest would be the Short S.C.1 jet-lifter, with its tilting cluster of vertically-mounted Rolls-Royce R.B.108 turbojets, and single propulsion jet of a similar type. A prototype of the S.C.1 was shown statically last year, since when it has achieved free vertical take-offs, hovering and slow-speed flight, and there is some hope that it will be available to appear at Farnborough, although it is just beginning its programme at the R.A.E. Bedford for transitional flight.

Apart from the Hovercraft, the remaining two complete newcomers to Farnborough are both civil types-the Armstrong Whitworth Argosy and the Vickers Vanguard. Both are also turboprop-powered by Rolls-Royce, the Argosy with four Dart 526s and the Vanguard with four R.B.109 Tynes. Five Argosies are so far flying, and two will be displayed at Farnborough—one on the ground and the other in the flying programme. One of the features of the static display will be the rapid loading at each end of the fuselage of the fifth Argosy, with the aid of the A.W.A. Rollermat system. Like the Argosy, the elegant Vickers Vanguard took part in this year's Paris Aero Show display, but it will be making its début before the British public at Farnborough. Its quietness and grace cannot fail to be impressive. Three Vanguards are flying at the moment, the third sporting the new and fashionable dorsal fin extension.

Although the Handley Page H.P.R.7 Dart-powered Herald has not hitherto been included in the S.B.A.C. display, since the prototype met with a mishap en route to Farnborough last year, it will not be a 100 per cent newcomer, since the airframe, as the H.P.R.3 with four Leonides Major piston engines, has been shown in previous



The second prototype Handley Page P.R.R.7 Herald is seen in B.E.A. livery. Three Heralds are to be used by B.E.A. on some Scottish routes. Note the underwing fuel tanks.

years. Its appearance this year, however, underlines the recent receipt of the order from B.E.A. for a period of experimental operation on the Scottish routes.

In the military sphere, new aircraft interest will be confined to modifications of previously-shown types. The principal items of interest concern two-seat trainer developments of fighter designs which are at the extremes of the weight scale. At the heavy-weight end will be the English Electric P.11 supersonic trainer (Ed.: Reportedly the Lightning T.4) or two-seat interceptor, with its crew accommodation arranged sideby-side, and its afterburning Avon turbojets one on top of the other. And as what may most appropriately be described as a flyweight, the Folland Gnat Trainer should make a highly interesting contrast, with its tandem seating, single unaugmented 4,230-lb. Bristol Orpheus B.Or.4 (100) engine and 7,500-lb. gross weight of about one-fifth that of the P.II.

The Gnat Trainer made its first flight only just before the S.B.A.C. show, and relatively little has been seen of its 7 per cent thickness-chord wing of some 30 per cent greater area than that of the single-seat variant. The use of outboard ailerons on the Trainer permit, for the first time, the

installation of split flaps on the Gnat's wing, which with the increased area, reduces the landing speed to R.A.F. training requirements. The bigger wing also reduces the possibilities of level supersonic flight despite the decreased t/c ratio, so a 5 per cent wing is being considered in conjunction with a reheat Orpheus for a M=1.5 Gnat Trainer Mk. 2.

Fourteen Gnat Trainers are on order for evaluation by the Royal Air Force, while the P.II or Lightning Trainer is also on order for the Service. Whereas the smaller aircraft is just transonic at the moment, the P.11 will enable student pilots to gain flight experience at speeds above M=2, or something like 1,500 m.p.h., and it is also capable of being used as a two-seat weapons system. Both trainers will be demonstrated alongside the single-seat fighters from which they were developed, and in the case of the Lightning, the aircraft shown will be a late pre-production example equipped to full operational standards as a weapons system. It will have its Airpass interception radar installed, together with autopilot coupling, and full armament of Firestreaks, twin Aden guns and Microcell rocket pack.

Another very advanced military aircraft which has not hitherto been available for examination at Farnborough is the Blackburn N.A.39. This flew over last year during the display programme, but was first shown on the ground at the recent Paris Aero Show. Of the twenty pre-production aircraft on order, seven have so far flown in the past fifteen months, which is exactly in accordance with the M.o.S. contract drawn up some four years ago. A study of the N.A.39 will reveal several of its unusual features; the large-scale incorporation of area rule for high-speed lowlevel flight is readily apparent, but less obvious is the boundary-layer control over the entire span. This results in the N.A.39 achieving the highest lift coefficient yet attained on this type of wing, and excellent control qualities down to the stall.

Boundary-layer control is selected automatically whenever the flaps are lowered, air being blown from the engine compressors, and necessitates a high degree of

Fourth prototype Argosy—there are now six flying—seen in Riddle Airline colours.

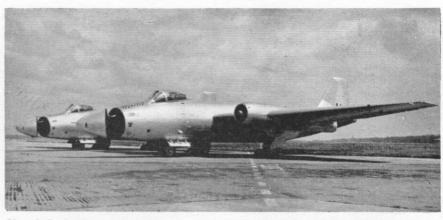


drag on the approach, which is provided by the 8-ft. air brakes at the rear of the fuselage. It is not generally appreciated that an aircraft's life is severely limited in low-level turbulence unless it is specially strengthened. Although essentially a small bomber, the N.A.39 is built to fighter strength, and is the first aircraft designed specifically for low-level operations. It not only has great structural strength and stiffness, but also a very long fatigue life.

The present shipboard strike aircraft and day fighter, which will be supplemented by the N.A.39, is the Supermarine Scimitar, and this type will be well represented at Farnborough. Four aircraft of No. 807 Squadron, one of the two Scimitar units in the Royal Navy, will be performing formation aerobatics, while there will also be demonstrations by individual machines. Like the N.A.39, the Scimitar also has blown flaps, but its super-circulation system does not extend over the entire trailingedge surfaces. A little-known fact about the Scimitar is that its nose-cone containing radar-ranging equipment may be rapidly replaced by a similarly-shaped fairing accommodating several cameras for tactical reconnaissance. The Tae-R equipped Scimitar is likely to be on show this year for the first time.

Senior Service participation will also include the de Havilland Sea Vixen F.A.W.1s of No. 892 Squadron, which was the first operational unit of the Royal Navy to equip with these all-weather fighters. As the first British fighter to enter service with air-toair missiles as its primary armament, the Sea Vixen has no fixed gun installation, carrying instead four Firestreaks on underwing pylons and twenty-eight 2-in. air-toair rockets in retractable Microcell glassfibre packs on the underside of the nose. The Sea Vixen has a secondary role of strike reconnaissance, for which it may carry bombs instead of missiles, but it seems unlikely that it will follow the Scimitar in being fitted with L.A.B.S. equipment.

Another naval aeroplane to be flown at Farnborough is the Fairey Gannet A.E.W. Mk. 3, which recently entered service on an intensive development basis with No. 700 "G" Flight at Culdrose. The latter



Short-built Canberra P.R.9s feature redesigned nose which opens sideways to provide entry for the navigator. A frangible panel just ahead of the canopy enables the navigator to eject in an emergency.

base has long been the home of No. 849 Squadron, the Royal Navy's airborne earlywarning unit, whose veteran Douglas AD-4W Skyraiders are at last being replaced by the Gannet 3. This type entered service in just under a year from the time the prototype first flew on 20th August 1958, after very extensive modifications had been made to the basic Gannet airframe to adapt it for A.E.W. duties. The fuselage was redesigned to accommodate a radar operator and a navigator, with their equipment, in a cabin aft of the wings, while the installation of a huge radome beneath the centre section necessitated the installation of a longer undercarriage and a completely revised empennage.

So far as the R.A.F. is concerned, large-scale participation in the Farnborough display is once again planned, with fly-pasts by Bomber, Fighter and Transport Commands. V-bombers and Javelins are likely to lead the aerial parade, while the transport contingent will include Comet 2s, Britannia 253s, and the venerable Hastings and Valettas. This year two C.F.S. Jet-Provosts will be performing synchronised aerobatics, and the familiar black Hunters of "Treble One's" incomparable team will take the aerial stage for their peerless exhibition of skill and spectacle. To talk of No. 111 Squadron's team is perhaps mis-

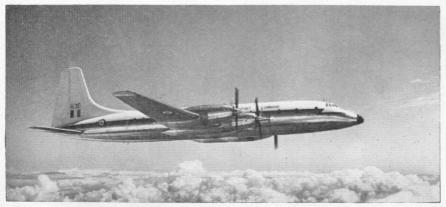
leading; all sixteen aircraft and pilots in the unit now take part, and after a formation take-off, split into two teams which provide a non-stop display of superbly synchronised aerobatics, with particularly effective use of smoke. The double "bomb-burst" at the end of their show is really something to see.

Other Hunters will be seen in the afternoon's flying, and also on static show. Airborne will be a Hunter Mk. 66A, of the type being exported to India, and of which Hawker Aircraft have the demonstrator, civil registered G-APUX. Unlike the T.7 shown statically, which has an Avon 115 of 8,050-lb. thrust, the Mk. 66 two-seat trainer is derived, as its designation suggests, from the Hunter F.6, and has the 10,050-lb. Avon 203 turbojet. The higherpowered trainer is better suited to Indian climatic conditions, where high-temperature operations reduce jet thrust for take-off and climb.

Two new variants of the Hunter which have not previously been seen in public are likely to be on show at Farnborough this year. They result from a contest for a ground attack fighter in the Middle East held in Aden by the R.A.F. earlier this year, when the Hunter proved capable of carrying extremely heavy loads and operating under the arduous conditions of terrain and climate. Beefed-up for the carriage of extra heavy underwing loads of stores and oversize drop tanks, with a more powerful Avon 203 and a tail-breaking parachute for reduced landing runs, the resulting Hunter F.G.A.9 first flew on 3rd July this year, and is scheduled to re-equip Middle East squadrons of the R.A.F. in the near future.

A further development of the F.G.A.9 is the Hunter F.R. Mk. 10, which differs only in having a battery of cameras in its modified nose, the full armament of four 30-mm. Aden cannon being retained. An earlier Hunter with a "photographic" nose was shown at Farnborough several years ago, and the F.R.10 is a production variant of this modification. With the Avon 203 similar to that of the F.G.A.9, the Hunter F.R.10 has its fuselage length increased from 45 ft. 10½ in. to 46 ft. 1 in. as a result of the modified nose, but the other dimensions are unchanged.

Britannia 253s for R.A.F. Transport Command are now being delivered to No. 99 Squadron at Lyneham.





Latest of the versatile Hunter is the F.R.10. Powered by a Rolls-Royce Avon 203 it features a new nose containing a battery of cameras.

Of the remaining fighters at Farnborough, the Javelin F.A.W.9 will be a newcomer in mark number, although not in shape and substance. The Javelin 7 and 8 have appeared in previous years, differing originally only in the type of airborne interception radar fitted in their needle-pointed rain-resistant noses, both having the 11,000-lb.s.t. Sapphire 200 turbojets. Reheat for these engines came along in time to be fitted to the Javelin 8 on the production line, but the F.A.W.7s had to be modified retrospectively for afterburning, becoming, in the process, Javelin 9s. All the later marks of Javelin are armed with D.H. Firestreak infra-red homing missiles on underwing pylons, and like the English Electric Lightning, they retain two 30-mm. Aden cannon as secondary weapons.

Among the heavy brigade the Handley Page Victor B.2 has not previously been shown in public, although there are few points of apparent difference from the Victor 1. One of the principal changes concerns the replacement of the 11,000-lb. Sapphire 202s of the Victor I by 17,250lb.s.t. Conway R.Co.11 turbojets, with a consequent substantial increase in performance, accompanied by improved fuel economy because of the lower specific consumption of the big Rolls-Royce engines. The Victor 2 also has a 10-ft. increase in wing span, to 120 ft., for better altitude performance, and appropriately larger intakes for the more powerful engines.

Like the Victor I, the B.2 is equipped for refuelling in flight, with additional fuel capacity from underwing tanks, while it can also carry the Blue Steel stand-off bomb. A new feature is the provision of retractable scoops above the fuselage just forward of the fin, which may be extended in flight to draw in ram air to drive turbo-alternators for high-altitude emergency power. That for low-altitude comes from an Artouste gas-turbine in the starboard wing root which is also used for engine starting on the ground. This makes the Victor independent of external starters on remote airfields.

The other V-bomber at Farnborough, the Avro Vulcan, will also be a Mk. 2, with more powerful Bristol Olympus 200 series engines and an extensively modified wing.

The latter was first seen on a prototype Mk. 1, which had the aerodynamic envelope of the Mk. 2, with an extended wing incorporating conical camber, and the Vulcan B.2 is currently in production although not yet in service. If security permits, both Vulcan B.2s at Farnborough will be shown with the self-propelled guided bombs known as Blue Steel, which is another Avro development. In the Vulcan this air-tosurface weapon is carried semi-externally. Another Vulcan will be flown past in the display programme without landing, powered experimentally by 17,000-lb.s.t. Conway turbojets; this aircraft has replaced a similar research prototype which crashed

No S.B.A.C. display would seem complete without a Canberra, which in May this year celebrated the tenth anniversary of its first flight and is still in full production. The latest variant for the R.A.F. is the P.R.9, which has been seen before at Farnborough, but the aircraft shown this year is in its most recent production form, incorporating several modifications. One of the principal changes concerns the provision of an ejection seat for the navigator, who in the P.R.9 is seated in front of the pilot in the nose, and was not previously provided with this invaluable escape aid. The Canberra P.R.9 was extensively modi-

fied by its manufacturers, Short Bros. and Harland, to incorporate a Martin-Baker ejection seat. To provide access to this on the ground, it became necessary to hinge the nose of the Canberra, and this is a feature of the high-altitude P.R.9.

Better-known features of this Canberra variant include its increased wing-span and centre-section chord; Fairey-powered aileron controls; 200 series Avon engines; and B(I)8-type bubble canopy. The P.R.9 is due to enter R.A.F. service in the near future.

Hunting's Jet Provost Mk. 3, which was a feature of last year's display, has since come into service with the R.A.F. at No. 1 F.T.S., Linton-on-Ouse, where all-jet training is now in progress. The Jet Provost 3 has twin Martin-Baker Mk. 4 ejection seats, a clear-view canopy and windscreen, and wingtip tanks, and is powered by a 1,750-lb.s.t. Viper A.S.V.8 turbojet. Another Jet Provost, which incidentally is not the Mk. 4 despite reports to the contrary, will display the advantages of the extra power conferred by an A.S.V.11 turbojet of 2,460-lb. thrust, while on static show will be the armed Jet Provost Mk. 51, of the type being exported to Ceylon.

For instruction on a smaller scale, the well-known Auster Aiglet Trainer will once again be uniquely aerobatted by Ranald Porteous, and another familiar civil aeroplane in the lighter-weight bracket will be the de Havilland Beaver 2 with its Alvis Leonides engine. Similar powerplants, but of the long-stroke Leonides 531/8 variety, developing 640 h.p. for take-off, are a feature of the Scottish Aviation Twin Pioneer 3 which will also be in the flying display. The actual aircraft shown is a new geophysical survey version incorporating some distinctive changes in its silhouette. Registered G-AOER, it carries electromagnetic equipment produced by Mullard Research Laboratories which results in wingtip and endplate extensions looking like additional mainplane fins.

Other light transports will be displayed statically and will include the D.H. Dove and Heron and the Hunting President. Airline equipment will be represented statically by a Britannia in Cubana colours and a T.A.A. Viscount, while a Comet 4B will

The first of B.E.A.'s Comet 4Bs is expected to enter service next January. Olympic Airways have ordered two.



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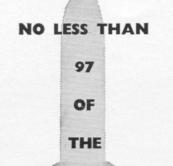
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fly in B.E.A. markings, making its initial public appearance.

As in previous years there will be a fine crop of helicopters at Farnborough, with pride of place taken by the impressive Fairey Rotodyne. This vertical take-off airliner has made a great deal of progress in flight development since its last appearance, gathering almost casually en route the 100 km. closed-circuit record for helicopters at 191 m.p.h., which exceeded by almost 30 m.p.h. the previous absolute record speed. Design development is now concerned with a larger Tyne-powered Rotodyne, and there is also considerable military interest in its procurement.

A recent demonstration of the Rotodyne featured its use as a flying crane, lifting a prefabricated bridge section more than 100 ft. in length, and the Bristol 192 in the

Farnborough display will also show its ability to lift heavy underslung loads as well as showing off its performance on one engine. This helicopter, which will be furnished partly as an ambulance and partly as a troop carrier, is powered by two 1,650-s.h.p. Napier Gazelle 2 gas-turbines, but is capable of taking off, hovering and climbing away at maximum all-up weight on only one powerplant. Eight Bristol 192s are now flying, and the type is planned to enter service with the R.A.F. in the summer of 1960.

Westland's will have their usual lively circus of helicopters, comprising two Westminsters, a Wessex, a Gnome-Whirlwind, a Leonides Major-Whirlwind and a Widgeon. Both Westminsters will be powered by 3,150-s.h.p. Eland E.229A engines, compared with the 2,800-s.h.p. Elands originally used in the first prototype, and the new powerplants have an oil cooler and fan mounted above them. The second Westminster, G-APEX, is similar to the first, G-APLE, except for speciallydesigned wheels and brakes which are some 300 lb. lighter than the Bristol Freighter wheels used on the first prototype. G-APEX also has a completely cowled engine and rotor pylon structure, with built-in maintenance platforms, and exter-

nal 250-gallon fuel tanks on each side of

Flown for the first time on 27th August the Folland Gnat Trainer is seen here during its final constructional stage.



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Farnborough '59

(continued from page 324)

the fuselage instead of inside in tandem. The Gnome-Whirlwind, which first flew on 28th February 1959, may well represent a remarkable new lease of life for this well-tried design. Although the D.H. Gnome develops a maximum of 1,024 s.h.p. compared with the 750 h.p. of the Leonides Major, it is 675 lb. lighter in weight, and increases the payload from 1,254 lb. to 1,846 lb. as well as improving the overall performance.

Although it may not be possible to use the full power output of the engine, because of transmission limitations, derating the unit permits a constant power output to be obtained, regardless of operating altitude or ambient air temperature. This means that the optimum performance can be maintained regardless of local conditions, and is the philosophy behind the Gnomepowered Saunders-Roe P.531 which now comes in the Westland group. The P.531 started life with a Blackburn Turmo derated to 300 s.h.p., which was subsequently increased to 400 s.h.p. Its transmission system is designed to cope with power up to 650 s.h.p. which is what the Gnome can be derated to deliver regardless of height or temperature.

Two P.531s will be shown at Farnborough, the second being the Mk. 2, G-APVL, with a Blackburn A.129 engine. This made its first flight only on 9th August this year, and is substantially different from the original P.531. The entire fuselage, including the cabin, engine bay, tail cone and tail rotor arm, has been revised in outline, giving the P.531 Mk. 2 a longer, sleeker appearance, and the four-wheeled landing gear has been replaced by more practical skids. With the Gnome-P.531 this should show a remarkable improvement in performance and handling, and should provide an interesting contrast with the Skeeter A.O.P.12, which is also on view, from the same stable.

All the now-familiar guided missiles of the British industry—Bloodhound, Firestreak, the Vickers Vigilant and the Seacat —will be on view, and there may be some less well-known shapes too. We shall see the Black Knight, Saunders-Roe's research vehicle for the de Havilland Blue Streak L.R.B.M.

Finally may be mentioned another airborne vehicle which dispenses with a pilot-the Australian Government Aircraft Factory Jindivik Mk. 2B. This short-life Viperpowered target drone is being shown by Fairey Aviation, who are the European sales agents and contractors to the Ministry of Supply, and has been extensively modified. The former NACA intake above the nose has been extended to a ram-type intake, and the wings have been lengthened for improved high-altitude performance. In this form, with a 25 ft. 7 in. span and wing camera pods, the Jindivik 2B has a ceiling of 54,500 ft., a maximum speed at that height of 600 m.p.h., a rate of climb at 40,000 ft. of 3,700 ft./min., and an endurance of 43 minutes.



The Westland Westminster "Flying Crane" (ABOVE) now has its fuel tanks mounted externally, and the rotor pylon is completely cowled. (BELOW) Another Westland helicopter to be seen at Farnborough is the Gnome-powered Whirlwind.



The Piper Tri-Pacer (continued from page 346)

comfortable touch-down speed in these conditions is about 50 m.p.h., but in the course of some dozen landings it was found that wide variations are possible, and that the aircraft is docile and safe whether the landing is as soft as a feather or a good hard thud; in either event the nosewheel touches the ground very soon after the mainwheels, so that there is no tendency to leave the ground in a bounce, and brakes and nosewheel steering are fully effective almost immediately.

The landing run is fairly short in any event and at light load in a twelve-knot wind there would be no difficulty in getting into a two-hundred-yard field, provided the approaches were good. The landing run can, however, be much reduced by harsh use of brakes, and after very little practice it was found that a landing run of little more than one hundred yards could be achieved. The expert can, however, do considerably better, and Wing Commander Murray did that morning demonstrate a landing in which the total run was comfortably under one hundred yards.

Finally, one must mention comfort; a small touch was the pilot's elbow rest, which is perfectly positioned and helps to

make the driving seat a good deal more comfortable than many motor-cars of comparable accommodation. This is typical of the thought and development that has clearly gone into this particular aeroplane. One is not surprised to hear that all executives at Piper's are pilots, and that they personally fly their Piper aeroplanes for business and travel. This is a pilot's aeroplane. It is also capable of hard work, and it will not surprise people to know that the Piper Tri-Pacers used by the Kenva Police Air Wing have given reliable service in the most arduous conditions. This is the sort of aircraft which is selling all over the world in quantity, and which is familiar in every country except England. We should all feel very much in debt to Vigors Aviation Ltd. for introducing this aircraft to the English market, and it is earnestly to be hoped that the pilots and designers from every aircraft firm in the industry will go and fly in it, and experience for themselves a light aircraft which is in production and selling at the rate of four a day. Not the least interesting point that they will note is the price of the model complete, as described here; it is £4,409 at the factory.