These Types Are At Farnborough

by a Special Correspondent

MODIFICATION, at least where the civil aircraft are concerned, is the keynote of the twenty-first annual exhibition of the Society of British Aircraft Constructors, which once again this month is making Farnborough the Mecca of aviation enthusiasts from all over the world. This year only one completely new aeroplane—the Avro 748—will be making its first public appearance in the flying display, although it is hoped that another newcomer, the Handley Page H.P.115 research delta, may be sufficiently advanced in construction to take its place in the static park.

This part of the display will also see a couple of the new Austers, which are prohibited from flying in the programme because of their American engines, but a large proportion of the other aircraft at Farnborough will show various degrees of modification. In most cases, these are concerned with the powerplants, so that careful examination may sometimes be needed to detect differences of installation, but the necessity for such an exercise of spotting skill is not likely to disappoint Farnborough enthusiasts.

The Avro 748 will be one of the few new types at Farnborough.

This year's display is also the first to be held since the British aircraft industry has been regrouped into its two major airframe and engine groups, plus the single helicopter organisation. Not that these changes are likely to be reflected in the products on display, and the flying programme still boasts about thirty types of aircraft, apart from the usual Service items. After a certain amount of reported indecision, the Royal Navy has now definitely decided not to participate in this year's display, because of the embarkation at sea of most of its first-line units, and the training programme commitments of the remainder.

Trans-Canada's Vanguard is now flying again after being grounded recently due to engine difficulties.

The four-seat Auster D.6 will be seen in the static park.

R.A.F. participation includes the now standard features of formation aerobatics by the C.F.S. Jet Provosts and the Black Arrows of "Treble One" Squadron, plus fly-pasts by operational fighters and bombers. This may well be No. 111 Squadron's swan-song at Farnborough, if not at any display, as a specialised aerobatic unit. Rumour has it that No. 92 Squadron, also with Hunter 6s, which has been the Fighter Command reserve aerobatic unit this year, is to take over from "Treble One" in 1961 on the international display circuit. So Farnborough may be the last chance to watch the incomparable Black Arrows after their magnificent aerobatic career over nearly five years.

Unusual items in the R.A.F. part of the programme will be a daily "scramble" by V-bomber crews to their aircraft, to demonstrate the four-minute readiness for take-off attained by our strategic bomber force. This will signify the start of the flying display, which will also include the appearance of an Avro Shackleton. While this may sound unexciting, it becomes more significant when it is realised that the Shackleton is on a twenty-four-hour non-stop and non-refuelled flight, taking off during one display, and landing at the same time on the following day.

To deal with the newcomer in the flying programme first, as befits its novelty, the Avro 748 prototype, G-APZV, has been successfully undertaking an unusually in-

tensive flight-test programme, having completed 60 hours in the first month after its initial flight on 24th June. In that time it flew up to a weight of 35,100 lb., and a speed of 270 knots E.A.S., and completed more than 200 stalls. Test pilot Jimmy Harrison should therefore be fairly familiar with his new mount for Farnborough: the need for urgency in the test programme is indicated by the fact that the 748 is due in commercial service next summer, with Skyways.

Although it will not be able to fly at Farnborough, the H.P.115 "paper dart" research delta is likely to attract a great deal of attention if it manages to appear. Its arrival is dependent on a great deal of hard work by its manufacturers, but it may be sufficiently advanced for static showing, even if uncompleted internally. This slim delta, powered by a Bristol Siddeley Viper turbojet, is a low-speed aerodynamic research vehicle for a Mach 2 supersonic transport, to obtain practical information on control and stability problems of such a radical configuration.

Of all-metal construction, the prototype has an aspect-ratio of less than unity, which means that its chord is greater than its span. It is therefore unlikely to be initially tested as a glider, as was at one time suggested, since its configuration is the antithesis of normal sailplane design.

An aeroplane which, although not new, has never previously been seen at Farnborough is the L.A.C. Prospector, and the example shown this year qualifies by the fact that it now has a British engine. In place of the 270- or 295-h.p. Lycoming engines fitted to initial production aircraft, the Prospector II has the veteran Cheetah X powerplant of the type fitted to Airspeed Oxfords and Consuls, and developing 410 h.p. for take-off.

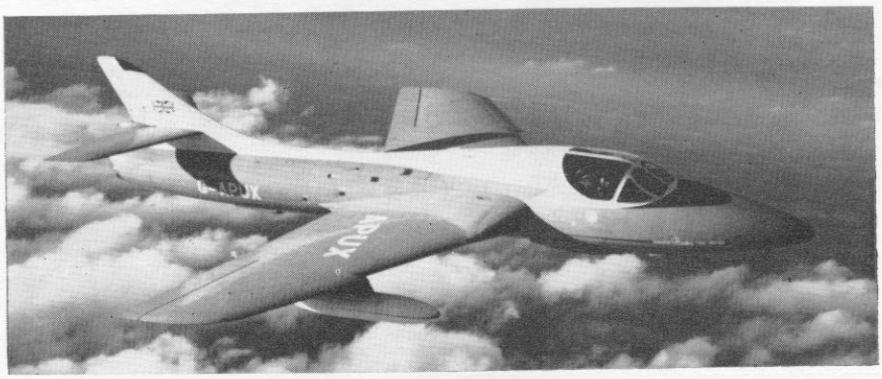
Such a modification originated in Australia, where the demands on load-carrying from agricultural aeroplanes are insatiable, and extra power is needed to maintain STOL characteristics under tropical conditions. The Cheetah installation adds about 660 lb. to the empty weight of the Prospector, but the gross weight has been similarly increased to 4,300 lb. Cruising and maximum speeds have been increased by 7 knots to 112 and 135 knots, respectively.

Completing the light plane newcomers to Farnborough are the new "D" series Austers, which will be represented by the two-seat D.4/108 and the four-seat D.6/180. Representatives of eleven possible combinations of design, with long- or short-span wings, and Lycoming engines of 108 to 180 h.p., the new Austers retain many of the well-tried features of previous Rearsby designs while adding such new items as metal wing-spars, improved soundproofing and standards of comfort, and Workmaster-type tail units of increased area.

Apart from these features, the D.4 is derived basically from the original Autocrat, while the D.6 corresponds to a developed Autocar. The standard of finish of these types is noticeably high, but the full range of these types, with their alternative 32 ft. or 36 ft. wings, alternative powerplants and resultant Auster alphabetical designations are going to cause more than a few headaches to recognition enthusiasts!

The Twin Pioneer Series 3 makes its first appearance at Farnborough. ("Flight" photograph.)

Another newcomer to the S.B.A.C. Show is the Victor Mk. 2.

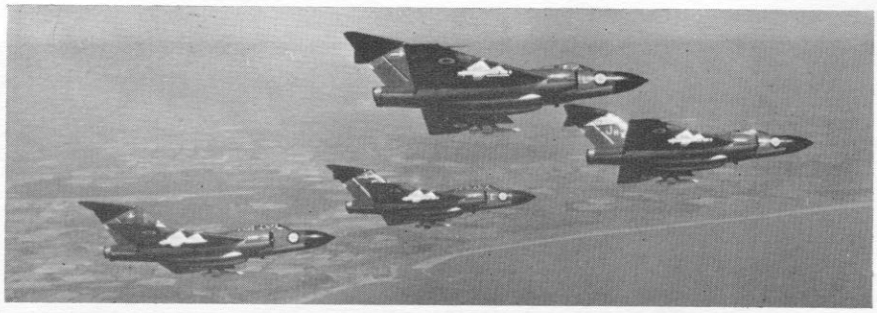


Bill Bedford will again be spinning the demonstration Hunter Mk. 66A.

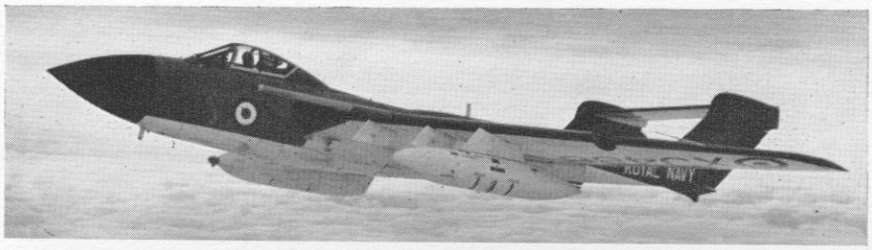
To continue with the civil aircraft on display, which now comprise about 50 per cent of the exhibits, the Avro 748's close commercial relation, the Armstrong Whitworth Argosy, will again be prominent, with probable representation in the static park as well as the flying programme. In addition to the standard civil aircraft, we may well see G-APRL, which is the flying "mock-up" or development prototype for the military A.W.660, with the alligator-jaw-type rear loading ramp. So modified, this aircraft first flew on 28th July, and is one of the original ten civil Argosies.

It now has the same aerodynamic rear fuselage shape as the A.W.660 (see page 304 for photograph), although the military Argosy has a 30-per-cent new airframe structure and equipment. It has no front loading door, but the beavertail rear door permits the air-dropping of supplies or vehicles in flight. Twenty-four A.W.660s were originally to be supplied to the R.A.F., but Transport Command is now to receive forty. They will be able to carry sixty-nine troops or 14 tons of equipment, and are due for initial delivery next year. The A.W.660 prototype fuselage is virtually completed at Baginton.

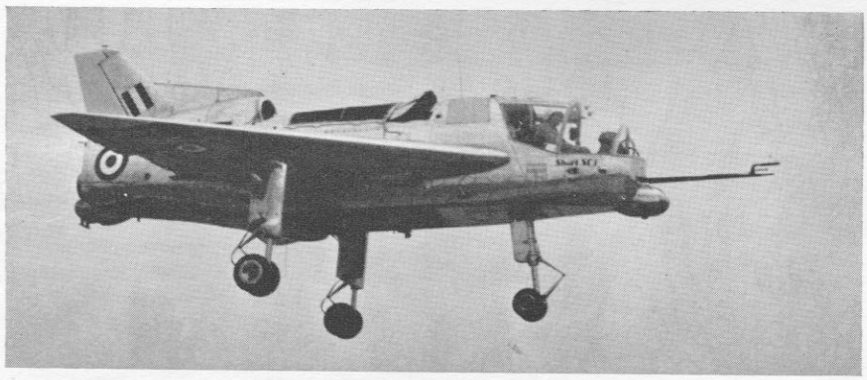
From the rival British Aircraft Corporation is being shown the Vickers Vanguard, which is expected to be CF-TKA. This is the first of twenty-three Vanguard 952s for Trans-Canada Airlines, who, with B.E.A.,



Javelins Mk. 9 of No. 25 Squadron. A Mk. 1 Javelin powered by D.H. Gyron Junior engines will also put in an appearance.



Two Sea Vixens will take part in a flight-refuelling fly-past.



The Short S.C.1 will give demonstrations of level and vertical flight and a full transition from vertical to level flight.

are the sole operators of this new high-capacity turboprop airliner. Development of its Rolls-Royce Tyne powerplants has taken slightly longer than was anticipated, but on reaching full-scale service, the Vanguard is expected to prove particularly economical, and therefore profitable to operate.

The evergreen Comet will once again feature at Farnborough, this year being represented by a Mark 4C in Misrair colours. This variant of the distinguished line has the longer fuselage of the Comet 4B, to accommodate 72–102 passengers, and the full-span wings, including leading-edge fuel tanks, of the basic Comet 4. The de Havilland division of the Hawker-Siddeley Group is also showing its new Dove 8A (see page 318 for photograph), which is distinguishable by the big exhaust thrust augmentation tubes beneath its 400-h.p. supercharged Gipsy Queen 70 Mk. 3 fuel-injection engines. The Custom 800 Dove also has a Heron-type "solid"-roofed canopy, and will have colourful interiors to individual requirements in the United States. It is being shown at Farnborough alongside the perennial Leonides-Beaver.

To round off the civil fixed-wing participation, there are the Handley Page Herald and the Scottish Aviation Twin Pioneer Series 3, both shown by proudly independent companies. Since its initial appearance at Farnborough last year, the Herald has flown some 170,000 miles on sales tours in 734 hours, through about forty-seven countries, and reports of sales in South America are expected to be announced. In addition to the standard forty-seven-seat version of the 39,000-lb. Herald, a longer-fuselage development is mooted, with an all-up weight of 41,000 lb.

The Twin Pioneer 3 has not previously been shown in production form at the S.B.A.C. display, and replaces the Series 2, which is no longer under construction. Thirty-two Pioneer C.C.1s were built for the R.A.F., together with four C.C.2s, and three Series 3s are being assembled for military use. Being shown is the Scottish Aviation demonstrator, G-APPH (c/n. 540), which has the now-standard Leonides 531/8B (Mk. 138) engines, developing 600/625 h.p. for take-off. The extra power gives a great improvement to the single-engine performance of the Twin Pioneer, particularly under tropical conditions, but the specification of this sixteen-passenger/4,000 lb. freight capacity transport is otherwise little changed. This also applies to such hardy transport annuals as the R.A.F. British Britannia 253, and the D.H. Heron 2 in the static park.

On the military side, as one might expect after the famous White Paper of 1957, there is not much new to be shown this year, and the types previously seen bear little evidence of modification or development. There are production examples of the Avro Vulcan 2 and the Handley Page Victor 2, neither of which has yet brought its improved operational ceiling and other performance increases into squadron service.

The English Electric Lightning F.1, on the other hand, is being shown for the first time in full production form as an R.A.F. operational squadron fighter, No. 74 Squadron at Coltishall having received its first aircraft a few weeks prior to the display. The two-seat Lightning F.4, probably also a production aircraft, is again sharing the claim of being the fastest aircraft in the programme, but it is unfortunate to reflect that the two English Electric machines will never be able to display their supersonic performance in public, except in a climb. In addition to two Firestreaks, and two 30-mm. ADEN cannon or forty-eight 2-in. rockets, the Lightning is designed to use later weapons, including ground attack items.

Whilst on the subject of ground attack, the Hunter F.R.10 at Farnborough was developed as a tactical reconnaissance version of the F.G.A.9, to carry vertical, oblique or forward-facing cameras, as well as the normal 4×30-mm. cannon and underwing armament. Powered by the 10,000-lb. Avon 203 or 207, the F.R.10 is to replace the Swift F.R.5 in R.A.F. tactical reconnaissance squadrons, and has been specially developed for low-altitude operations. With provision for carrying underwing 230-gal. drop-tanks as well as the normal selection of offensive stores, the Hunter 10 offers a formidable versatility.

In the 1959 display at Farnborough, test pilot Bill Bedford's prolonged spinning, with smoke, in the orange Hunter T.66 demonstrator G-APUX, was both a technical and a spectacular highlight. Since then, this almost unique programme of spin exploration in a high-speed jet fighter has continued, and thorough exploration has been made of the inverted spinning characteristics of the Hunter. This sort of programme has virtually never previously been embarked upon in a transonic swept-wing aircraft, and the Hawker test pilot team has achieved an invaluable advance in both pure and applied research. In the course of hundreds of spins of all types, very positive recovery drills have been developed, and a previously grave emergency has been con-

verted into an almost routine manoeuvre. The fruits of this work are likely to be seen in the performance of G-APUX in this year's display.

At the other extreme of the jet trainer scale, the Folland Gnat is making its initial appearance in public in standard R.A.F. fluorescent red instructional markings, having received an additional order to the pre-production batch of fourteen started about a year ago. With a 4,230-lb. B-S Orpheus 100 turbojet, the Gnat Trainer has a maximum speed of 545 knots at 35,000 ft. and climbs at 8,000 ft./min. It will eventually replace the Vampire T.11 at R.A.F. flying training schools. The new sequence will then be Jet Provost/Gnat Trainer, instead of Provost/Vampire, and the Viper II Jet Provost 4 is being displayed in the same programme as the Folland trainer.

Returning to operational fighters, the Javelin F.A.W.9 is at Farnborough, as it was last year, but there is also another example, XA552, of this delta-winged interceptor fitted with two de Havilland Gyron-Junior D.G.J.10 turbojets for test purposes. The Gyron-Junior Javelin has been flying for several months to provide flight experience at high subsonic speeds and altitudes with this high flight Mach number engine, which is to power the Bristol 188 supersonic research type. Developing 10,000 lb. thrust dry, the D.G.J.10 was designed from the start to employ reheat, and has a high-performance afterburner operating at 2,000°K, which boosts power by 40 per cent to 14,000 lb. at sea-level.

The Gyron-Junior, of course, also powers the Blackburn N.A.39, in which a large percentage of its compressor airflow can be diverted by means of an air-bleed manifold, for flap, wing and tailplane blowing. The resultant improvement in low-speed stability and control will again be apparent to the expert eye at Farnborough this year.

Naval aircraft representation also includes a demonstration by two D.H. Sea Vixens of flight refuelling, using the "buddy" self-contained underwing pack fuel system, and a wing-mounted probe. The Flight Refuelling Mk. 20 refuelling pod has a tank capacity of 150 gallons, but additional fuel can be transferred from the carrier aircraft's tanks. It can deliver its internal fuel in one minute through 55 ft. of hose at flying speeds of up to 310 knots and heights up to 45,000 ft.

In the research field, a major highlight this year is the first public demonstration of a full transition from vertical to level flight by the Short S.C.1 VTOL aircraft. Flown by Tom Brooke-Smith, the S.C.1 made a tentative appearance at Farnborough last year in its hovering role, supported by its four 2,200-lb. Rolls-Royce R.B.108 lifting turbojets, but this year, following its initial transition on 5th April, it is to take off and land vertically, with a demonstration of level flight, under the impulse of its fifth R.B.108 propulsion unit, in between.

Although the 7,800–8,000-lb. S.C.1 is not necessarily representative of future VTOL types, its configuration has been proved a practical proposition over prolonged testing, and the myriad problems of stability and control speed through an unprecedented speed range have been effectively solved. The application of a similar "flat-riser" VTOL principle, with no change in fuselage attitude, is to be seen on models of a supersonic strike fighter and a civil transport on the Short stand.

Research representation at Farnborough is also marked by the second S.B.A.C. appearance of the Napier-operated Avro Lincoln, for Spraymat de-icing development. Wing and tail sections of several different aircraft, such as the Caravelle, Comet, Beverley and Britannia, have been mounted above the fuselage behind the spray rig, and components of some of the types of the future are likely first to become airborne on the broad back of this Lincoln.

Last, but by no means least at Farnborough, may be mentioned the helicopter circus, which under the latest reorganisation is an all-Westland affair. No fewer than ten rotorcraft are being displayed in the flying programme, not to mention the S.R.N.1 Hovercraft, which continues to defy definition. In addition to such familiar helicopters as the Widgeon, Leonides-Major Whirlwind, Rotodyne, Wessex and Belvedere, the Westland display includes developed or modified designs represented by the "covered wagon" Westminster, the Gnome-Whirlwind, with its Mark 10 military designation, and re-engined Wasps and a Skeeter.

In this largest range of turbine helicopters ever to appear together, the Westminster, G-APLE (see page 304 for photograph), take pride of place as the largest, having flown at more than 34,500 lb. all-up. It has reached 11,000 ft. altitude and its fabric on wood-stringers covering has increased the maximum speed from 110 to 130 knots. It has lifted a maximum weight of 6,759 lb. (a four-ton truck), and has been recently undertaking trials on blade stall at certain forward speeds. In the course of its flight-test programme it has also been fitted with a six-bladed rotor, in place of the normal five-bladed Sikorsky type, which increases the cruising speed by up to 15 knots.

A production order has been placed for the Whirlwind 10 for the Services, for whom the increase in performance conferred by its 1,050-s.h.p. Gnome turbine engine will be invaluable, especially under tropical and high-altitude conditions. The installation of a powerful but light turbine derated to maintain virtually a constant maximum output regardless of ambient conditions is also apparent in the six-seat Nimbus-Wasp, whose Blackburn A.129 power unit is derated from 885 to 650 s.h.p., and in the Gnome-Wasp, with its basic 900 s.h.p. H.1000 powerplant. As is now generally known, Wasp is the civil name for the P.531 series of helicopters, the Army name being the Sprite (P.531-2 Mk. 1), with a six-inch longer rear fuselage, and the Navy designation, the Sea Sprite.

In the Turmo-Skeeter, installation of the Blackburn turbine, derated from 425 to 250 s.h.p., instead of 215-h.p. Gipsy Major, has resulted in a climb of 1,420 ft./min. compared with the previous 1,150 ft./min.; a service ceiling of 18,000 ft. instead of 12,800 ft.; and a hovering ceiling of 15,000 ft. in free air instead of 5,500 ft. in ground effect. Gross weight is 2,350 lb. instead of 2,200 lb.; 50 gallons of fuel is carried instead of 23; and the payload is 198 lb. instead of 358 lb. The Turmo-Skeeter is being used for the development of the Newmark autopilot for the Wasp.

In addition to the Gazelle-powered Wessex 1, a Mark 2 version is under development with two 1,250-s.h.p. Gnomes, a gross weight of 13,500 lb., and a service ceiling of 20,000 ft. The other Gazelle-engined Westland helicopter, the Belvedere, has achieved prominence recently through its long-distance flight to Malta, and is appearing this year, after a remarkable variety of empennages, with its finalised double-anhedralled tailplane. The Belvedere, which can carry nineteen troops, has a maximum speed of 120 knots, and can fly on either of its Gazelles, with an autochange operation to single-engined flight of two seconds. Mention has been made of the Westland (ex-Bristol) 192C and 192D twin-rotor developments for civil use, as well as of the bigger 194.

Finally, the Hovercraft can be expected to show rather higher forward speeds, up to 60 m.p.h., and a slightly increased ground clearance since the installation of its additional Blackburn Marboré engine for forward propulsion.

The first production Sprite for the Army. The civilian Wasp will be demonstrated at Farnborough.