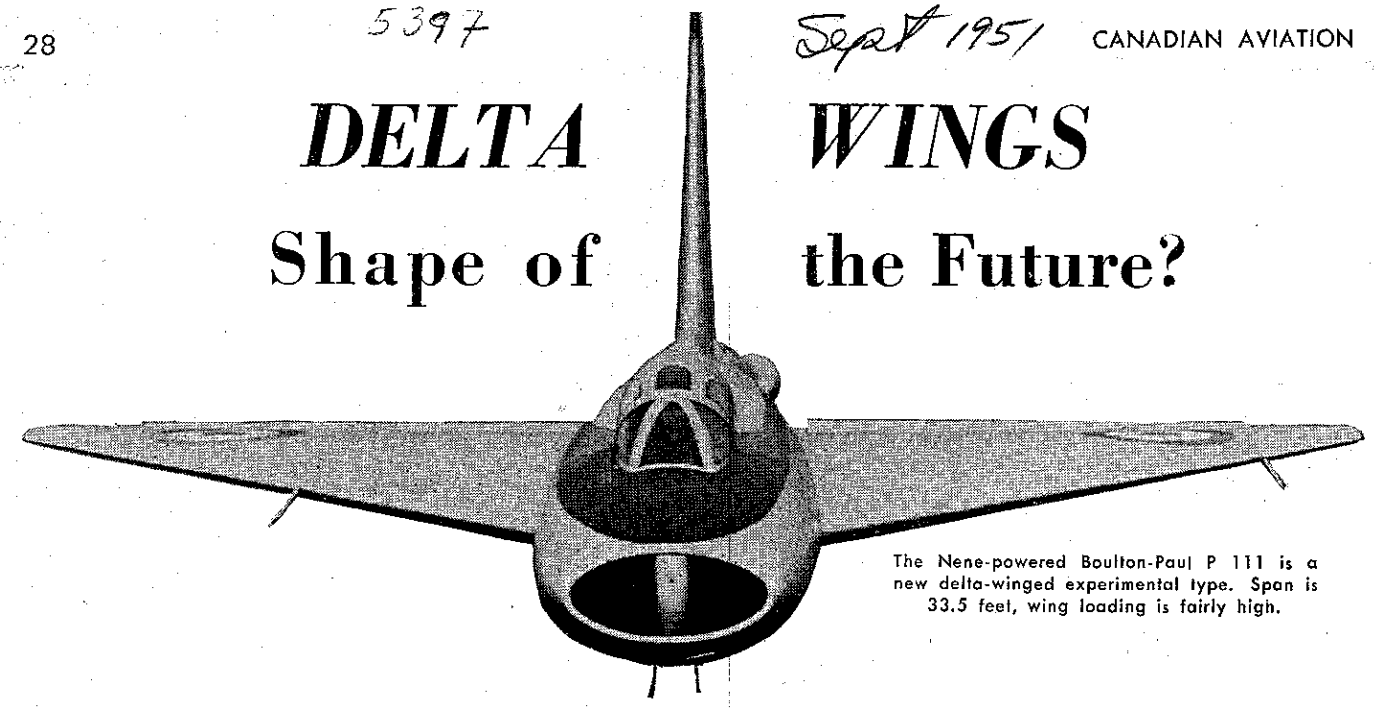
5397 Sept 1951

DELTA WINGS

Shape of the Future?

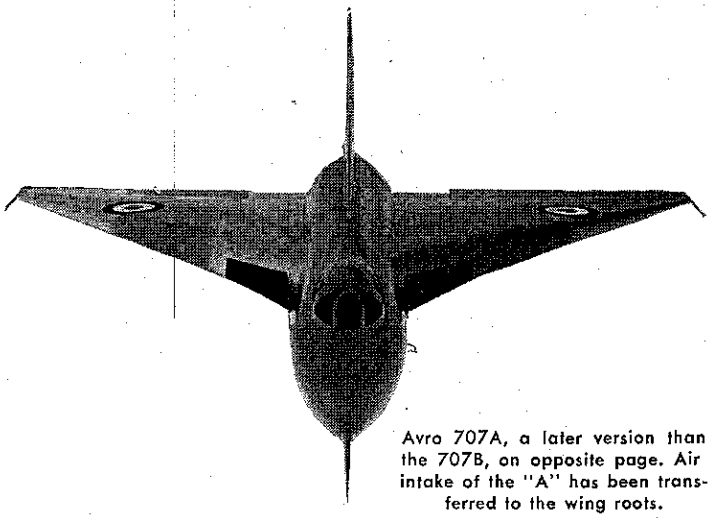


The Nene-powered Boulton-Paul P 111 is a new delta-winged experimental type. Span is 33.5 feet, wing loading is fairly high.

RADICAL PIE-SHAPED WINGS ARE IN THE AIR AS U. K. FLIGHT RESEARCH EXPLORES NEW IDEAS

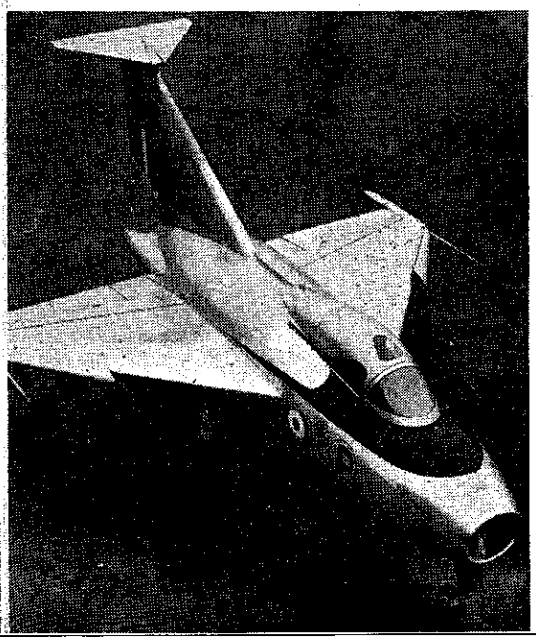
THE fresh laurels gained for the British airplane industry by its latest jet bombers and fighters are certainly not to be rested upon, and the year has seen the appearance of many new and important research airplanes. These have signified Britain's leading position in at least one profoundly important field of aerodynamic research, namely the delta wing experiment. Upon the team of four deltas, two of which flew for the first time in 1951, largely falls the weighty responsibility of securing for Britain the lead in aerodynamic and structural design.

Several British authorities have more or less staked their reputations on the promise offered by the delta wing configuration and demonstrations of these deltas have proved that a great deal of what was until recently theory can now be accepted in practice.



Avro 707A, a later version than the 707B, on opposite page. Air intake of the "A" has been transferred to the wing roots.

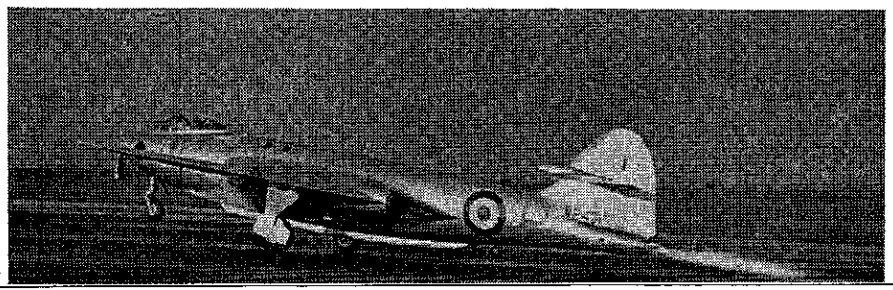
BELOW—Smallest British aircraft, the delta-winged Fairey FD 1 has a wing span of only 19.5 ft., may be experimental predecessor to a rocket fighter.



The **Avro 707B**, powered by a Rolls-Royce Derwent and appearing for the first time last year, has now been joined by the similarly powered but more advanced **Avro 707A**, and both machines are now engaged on a comprehensive sub-sonic research program which is generally associated with the development of a four-jet delta-wing bomber at present taking shape and perhaps destined to be one of the highlights of our next year's annual review of British aviation.

At first glance, the Avro 707A appears to be different from the "B" model only in the type of air intake employed, but closer examination reveals that refined, high-speed controls are used, the ailerons of the "A" being placed further outboard and a

BELOW—The Hawker P 1072, first British fighter to use liquid-rocket boost. It is the 1040 with the new Armstrong-Siddeley Snarler rocket in the tail.



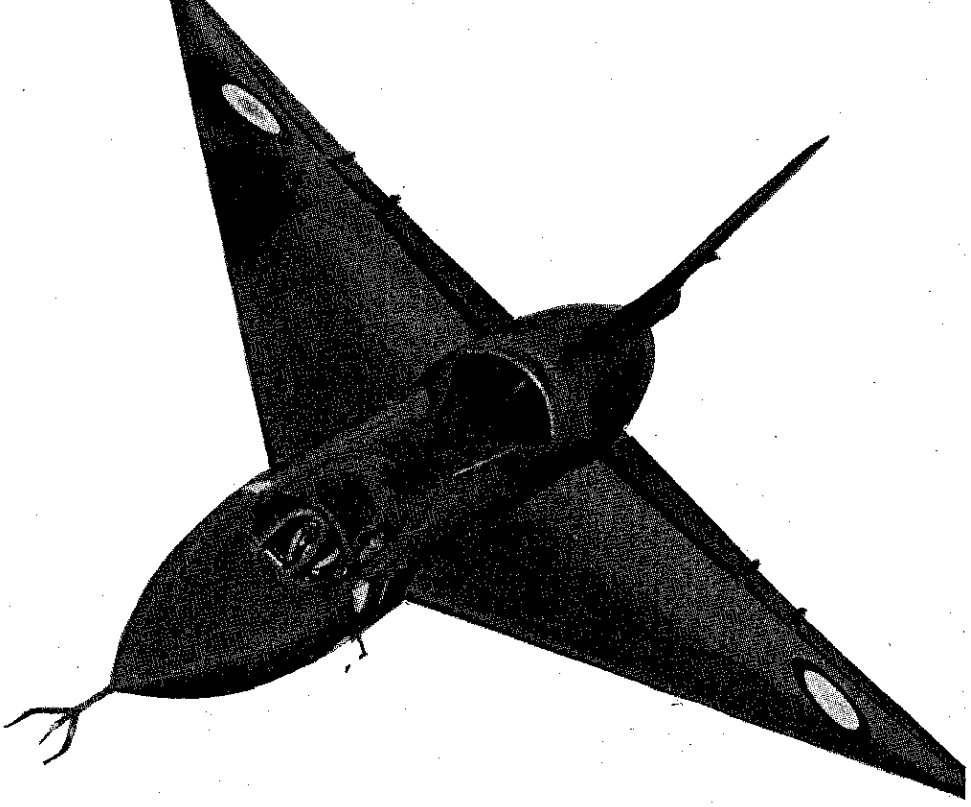
flap to assist trim and dive recovery supplanting the inboard elevator sections of the "B." The root profile of the Avro 707A has been modified to incorporate the air intakes which replace the dorsal "saddle" type intakes of the other machine.

On a smaller scale and intended for research at speeds associated more with fighters, are the **Boulton Paul P111** and the Fairey F.D.1. The P111 is powered by a 5,000-pound-thrust Nene engine which is fed by a flattened oval intake in the nose. Spanning 33.5 feet, the P111 has a good deal higher wing loading than the Avro deltas and the leading edge is noticeably sharper. The control surfaces are sealed and, acting together or differentially to serve as elevators or ailerons, are generally known as elevons.

The smallest airplane produced in Britain during 1951 and the remaining member of the delta quartette is the **Fairey FD1** which spans only 19.5 feet. The FD1 carries a T-type tailplane and wing slots for its initial trials but these will be discarded later in the test program. Fairey Aviation have announced that the FD1 has been designed for "important research work with revolutionary possibilities in the design and operation of fighter aircraft," which is generally interpreted to mean that the FD1 is a prototype for a vertically launched rocket-powered "target-defense" fighter.

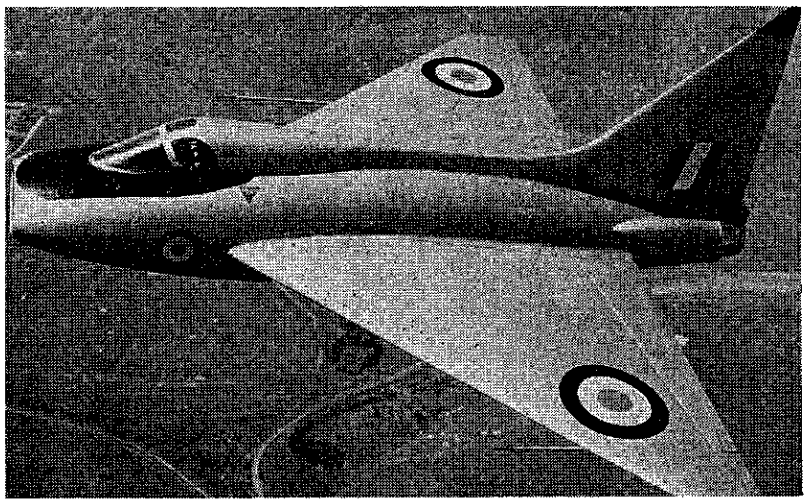
Another of 1951's crop of research airplanes was the ill-fated Handley Page **HP88**, a most intriguing aerodynamic pie, the "crescent" type wing of which was jointly designed and constructed by Handley Page and Blackburn General Aircraft. A Supermarine finger in the pie could also be discerned, the fuselage apparently being that of the third prototype Supermarine Type 510, an ancestor of the current Type 541 Swift. The wing, which was of double-cranked planform and featured very noticeable flap guides and mass balances, is said to have been a reduced-scale version

(Continued on page 60)



ABOVE—The Avro 707 B flew for the first time last year, has now been joined by the 707 A. The two deltas are now engaged in research flying believed to be associated with development of a four-jet bomber.

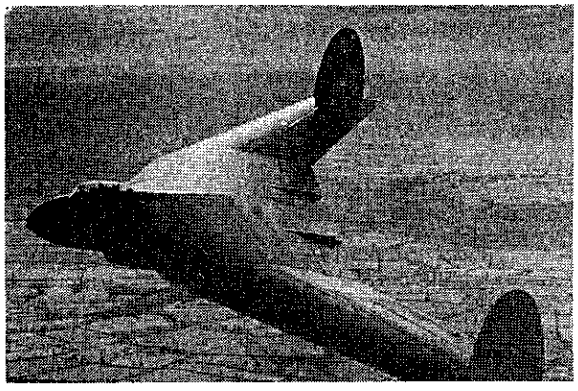
BELOW—This view of the Boulton Paul P 111 shows the delta wing plan and the "elevons" which serve the dual function of elevators and ailerons.

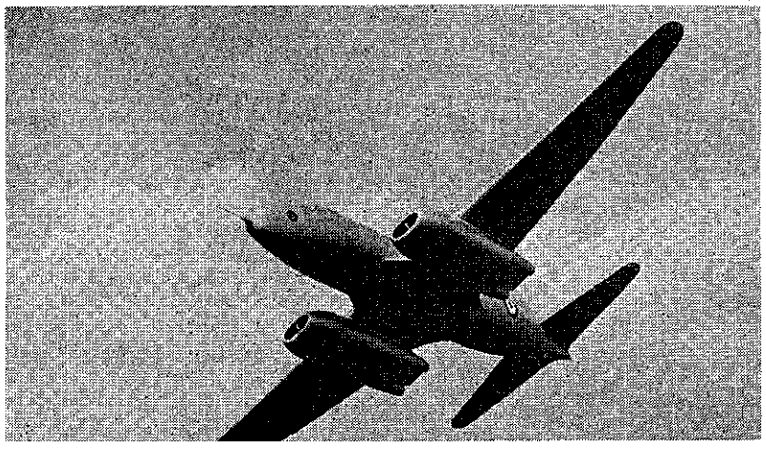


LOWER LEFT—One of the pioneers in British postwar flying research, the Armstrong Whitworth AW 52 "flying wing" has been investigating the problems of high speed flight with this type.

BELOW—The Avro Ashton, powered by four Nenes, is a high-altitude flight research laboratory. Six of the type have been ordered by the British Ministry of Supply.

Photo Courtesy "Flight"





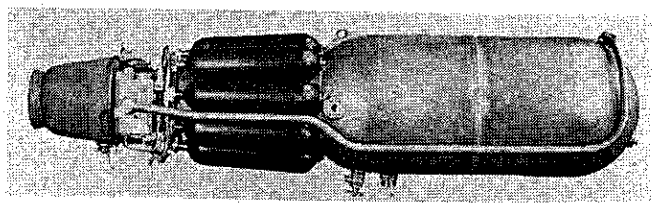
fact, two ASM3 Mambas which, although attached at the front end and using the same air intake and airscrew shaft gear casing, are otherwise two quite separate power units. Net dry weight of the ASMD1 is 2,000 lb. and a total of 2,640 eshp, plus 810 lb. residual thrust is delivered for a fuel consumption of 270 galfl per hour.

A pure-jet version of the Mamba ASM3, weighing only 550 lb., is known as the **Adder ASA1.** The Adder gives a take-off thrust of 1,100 lb. at 15,000 r.p.h. and has a fuel consumption (at maximum continuous cruising thrust —900 lb. at 14,250 r.p.m.) of 1.20 lb./hr./lb. thrust. The central boss at the intake annulus of this small, slim unit is extended to form a long, streamlined "snout" in which is housed the starter unit.

(The Adder powers the first (piloted) prototype of the Australian high-speed pilotless airplane that is undergoing tests on the Woomera rocket range in Western Australia. Later examples of this airplane will be powered by the **Viper ASV1,** which gives a thrust of 1,145 lb., or the ASV2 which gives 1,500 lb. st. This is an expendible version of the Adder, but the units differ in that the Viper has an annular combustion chamber and a different turbine; it is unique among current British power plants in using unorthodox materials in its construction. The Viper's working life is not intended to be much above 10 hours and. thus, normal commercial steels can be employed in place of the special materials used in nonexpendible units.

Another British production turboprop is the **Rolls-Royce Dart** which was first tested in the nose of a Lancaster in 1947. The Dart, which passed two type tests to ARB conditions, one at 1,000 eshp, and another at 1,250 eshp. is now giving 1,400 eshp, plus 295 lb. jet thrust in the Viscount 700. This version of the Dart, the **RDa3.** is also installed in two Dakotas which are used by BEA on short- and medium-range cargo hauls.

Development of piston engines in Britain has continued unobtrusively during the past year. and well-established units such as the Gipsy Major and Queen, the Cirrus Major and the Bristol Hercules have continued to enhance their already enviable reputations. However, there appear to be one or two gaps in the British airplane power range that could well be filled. For instance, the lack of lightweight units in the 40-60 hp. bracket is sorely felt by ultra-light plane enthusiasts, and radial piston-engines in the 500-1,000-hp. category would find a ready market, although we believe that Alvis Ltd. has already taken the latter requirement in hand.



DE HAVILLAND SPRITE ROCKET MOTOR. A liquid-fuel cold rocket motor for semi-permanent installation on aircraft for take-off assistance. Length, 84.25 in.; Diameter, 19.5 in.; Empty Weight, 250 lb.; Operating Weight, 925 lb.; Rated Continuous Thrust, 5,000 lb.

Blackburn and General have launched a new and advanced series of in-line engines, headed by the now type-tested 180-hp. **Bombadier** which has recently appeared in the Auster B4, Model S and Saunders-Roe (Cierva) Skeeter. The Bombadier is strictly a postwar unit, its main point of difference from all previous Cirrus engines being the use of direct fuel injection into the cylinders. Other engines of greater power, one of them supercharged, are under development to form a series with the Bombadier. These are the **Musketeer** and the **Grenadier,** the latter being a supercharged unit developing 300 hp. Overseas orders for the earlier Cirrus units continue to be placed, the latest being for the Major III which will power the new Hindustan HT2 elementary trainer, 300 of which are on order.

The only airplane power plant being produced by Alvis Ltd. at the present time is the 500-550-hp. nine-cylinder radial **Leonides,** production of which is being stepped-up to meet ever-growing demands. The vertically-mounted version of the Leonides for helicopter installation is used by the Westland S51 Dragonfly, the Bristol 171 Sycamore and the new Bristol 173, while it is hoped that the unit will soon be giving increased power sufficient for its installation in the Westland S55. The standard Leonides is also required for use in the Percival Prince, Pembroke and Provost and very recently a licensing agreement has been discussed with the Italian Government with a view to building the Leonides in that country.

In spite of the Bristol Aeroplane Company's heavy gas turbine commitments, production and improvement of the **Hercules** and **Centaurus** radial piston-engines continues.

COVERS UK AND EUROPE

William Green, ex-RAF, experienced air correspondent resident in London, who has been appointed editorial representative for Canadian Aviation, reporting on significant aviation developments in Britain and Europe. He is well-known to our readers for his series of informative articles on aviation in various Atlantic Pact countries. During the war he instructed in theory of flight, aerodynamics and allied subjects, also served in aircrew duties with the RAF. His address: 4 Beauval Road, East Dulwich, London SE 22, England. Tel: Forest Hill 8712.

Delta Wing Designs Shape of the Future

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of that to be fitted to the forthcoming Handley Page **HP80 four-jet bomber,** but unfortunately the HP88 was totally destroyed during the early test flight.

Perhaps the most interesting of the year's power plant development airplanes was the experimental Hawker P1072, Britain's first fighter to employ liquid-rocket boost. The P1072 is, in actual fact, the original P1040, ancestor of all Hawker jet fighters, modified to test the new Armstrong Siddeley Snarler rocket. The Snarler is installed in the rear fuselage of the P1072, a ventral pipe carrying three minutes' fuel (a mixture of liquid oxygen and water/methanol) from a tank behind the pilot to the rocket motor. At sea level the Snarler boosts the P1072's power by 2,000 pounds, but thrust increases with altitude and at, say, 50,000 feet, the Snarler can double the power available to the P1072 from its Rolls-Royce Nene.

WILLIAM GREEN