



First prototype Nord 1500 Griffon canard (tail-first) delta-wing, missile-armed interceptor. The power unit is a S.N.E.C.M.A. Atar 101E.

THE GALTIER DELTA FAMILY . . .

jet fighter, designed for a Nene or Tay fed by lateral intakes. Both were shoulder-wing aeroplanes at a time when the low wing was almost universal. Unfortunately, the Arsenal lacked an experienced jet pilot for the VG-70, so that little flying was done on it; and both flying prototypes of the VG-90 were lost, one through control-booster failure and the other due to the undercarriage uplock releasing during a fast, high-g manoeuvre.

M. Galtier's next venture followed an equally novel aerodynamic line. Asked to devise a short-range interceptor combining rapid climb with high speed, he adopted a delta layout as the best solution for obtaining sufficient wing area for climb and manoeuvrability with the necessary low thickness/chord ratio to delay compressibility-drag-rise and yet give sufficient structural depth for stiffness. Having decided on a delta for compactness, M. Galtier went further in this direction and virtually designed the aeroplane round a straight-through duct for a S.N.E.C.M.A. Atar turbojet, with the load-carrying part of the fuselage added as a superstructure. The use of elevators and ailerons on the wing trailing edge in addition to a trimming tailplane is an unusual, and apparently highly successful, combination.

M. Galtier is a very retiring individual and one given to long and careful thought around a subject. He conveys the impression of being extremely objective and careful to a degree. The Gerfaut programme was based, therefore, upon full-scale glider testing as well as upon normal wind-tunnel work, and so a wooden glider, the Ars.1301, was built (actually, it was originally made for a supersonic rocket-fighter project, the Ars.2301, which was abandoned). For the Gerfaut programme the glider's swept wing was

replaced by a delta, flown both with and without a trim plane.

The design and construction of the Gerfaut, which was a complete break with all M. Galtier's previous work, was remarkably rapid; design started in September 1952, the prototype was completed on September 26th, 1953, the first taxiing trials were made on October 20th, and the first flight on January 15th, 1954. On August 3rd Mach 1 was exceeded in level flight without afterburning—the first occasion on which this was accomplished.

The key factor in the high performance of the Gerfaut is certainly the straight-through engine duct, which is truly circular from nose to tail. This allows the Atar 101D to develop its full thrust of 2,800 kg (6,200 lb) with minimum duct losses. The moderate gross weight of the Gerfaut, at 4,750 kg (10,470 lb), results in a low thrust loading. One curious fact is that construction was pressed on so rapidly that the "high-speed" wing, with a span of 6.5 m (21.4ft) and area of 19 sq m (204 sq ft), was finished before a "low-speed" one of 7.5 m (24.6ft) span and 26.2 sq m (282 sq ft) area. The original intention was for the pilot to gain experience with the larger wing and then to fit the small one for high speed. However, fortified by some hours of practice on the Avro 707C at Boscombe Down, the S.F.E.C.M.A.S. chief pilot, M. André Turcat, carried out all the initial trials with the small wing.

Both the smaller and larger wings have a sweep of $57\frac{1}{2}$ deg and a thickness of $5\frac{1}{2}$ per cent, so that their wave-drag characteristics are similar. Despite the greater frontal area the Gerfaut remains a level-supersonic aeroplane without afterburning, although the engine is now so equipped. With the larger wing go medium-, instead of high-pressure, tyres and greater operational flexibility.

The superstructure cockpit and V-windshield confer a profile similar to that of some of the fast American types. The "sweep"

(Left) View from above of the air-intake duct, with the cockpit-floor support structure. At the top of the picture can be seen the intake lip of the Atar and above it the fuel tank platform, with mounting for an immersed pump. (Centre) The pressure cockpit, which, built separately as a superstructure, is mounted on top of the engine duct. The Gerfaut was one of the first aeroplanes to have a raked knife-edge windscreen. (Right) The fairing behind the cockpit also forms the fuel tank. In addition to the access holes, a filler cap, contents-gauge unit, venting and pressurizing pipes can be seen.

