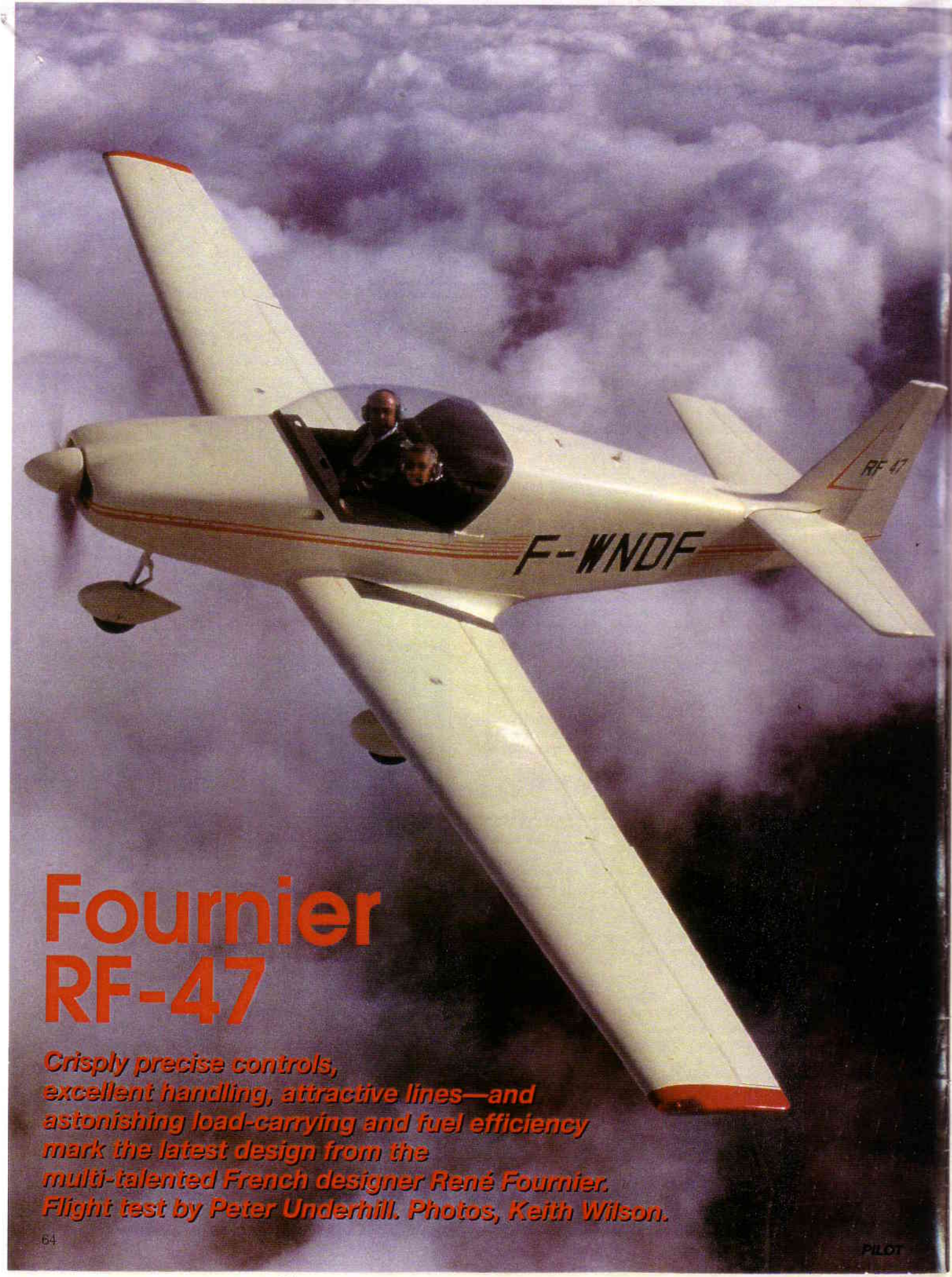

Fournier RF-47

Crisply precise controls, excellent handling, attractive lines—and astonishing load-carrying and fuel efficiency mark the latest design from the multi-talented French designer René Fournier. Flight test by Peter Underhill. Photos, Keith Wilson.

RENÉ FOURNIER is an artist—a skilled painter, poet, violinist, ceramic designer and draughtsman—who has had almost as significant an effect on the world of general aviation as have Stelio Frati in Italy, Britain's Geoffrey de Havilland and fellow Frenchman Jean Délémontez.

Born in 1920, Fournier joined the French Armée de l'Air just prior to WW2 and went through their engineering academy at Rocheforte. After the war he started a ceramic business, but by now, having worked around aeroplanes, he also wanted to fly. He had no funds to buy an aircraft, so he designed his own, working at night while tending his ceramic kilns. His first aircraft, the RF-1, flew in June 1960, and subsequently won a French Government award for its excellent flying characteristics. This was a single-seater with a high aspect ratio wing and a modified VW powerplant, which could be switched off, leaving the RF-1 to be flown as a conventional glider.

The RF-1 was followed in 1962 by the improved RF-2, developed in conjunction with Pierre Robin's Dijon-based Centre-Est (now Avions Pierre Robin) organisation. Thereafter Fournier went his own way to refine his motor-glider concept, designing the much-improved RF-3, which was certificated in 1963. Fournier then formed Société Alpavia at Gap-Tallard in south-east France, midway between Lyon and Monaco, in partnership with the Compte Antoine d'Assche.

The company took over production of the Jodel D.117A model from Société Aéronautique Normande at Bernay and simultaneously produced the RF-3, a single-seat taildragger motor-glider with a single-wheel main undercarriage and outriggers, powered by a 39 hp Rectimo engine (basically a modified VW power unit). Some 88 were built, during which time the company became increasingly involved with the German aircraft manufacturer Pützer.

The aerobatic RF-4 was subsequently produced by a new company, Sportavia-Pützer GmbH, jointly formed by the Compte d'Assche and Pützer, who built 155 examples. Alpavia's factory was sold and that company reorganised into a Paris-based sales support role.

René Fournier then set up as an independent consultant and designed the tandem-seat RF-5, which featured folding outer wing panels and a 68 hp Limbach engine. This again proved a successful concept, Sportavia producing and selling 126 of the basic version and 79 of the improved Sperber. A three-seat derivative, the RF-6, was investigated, but never put into production, but two other derivatives of the RF-5 were built, one for possible military reconnaissance, fitted with a much-quietened Lycoming O-235-E2A.

All these Fournier designs were characterized by their high aspect ratio wing and excellent aerodynamic efficiency. Built of traditional wood/fabric construction, they are extremely economical, and with several hundred still operating in 35 different countries of the world, are much loved by those who own and fly them.

René Fournier decided to go it alone and, with some financial help from the French Government, set up the Société des Avions Fournier in a small factory, in an idyllic forest-bordered setting with its own private strip half a mile from his home on the Loire Valley east of Tours. He began to manufacture the RF-6B, a side-by-side two-seat trainer-*cum*-aerobatic machine powered by a Rolls-Royce Continental O-200A engine. With 41 completed, and with firm orders for another 40, the financial rug was pulled by the French Government after some heavy political lobbying by a competing manufacturer, leaving Fournier with debts of over two million francs.

Avions Fournier and its assets were later bought—"for a song", claims Fournier—by a French entrepreneur, who subsequently sold a production licence to the Slingsby company. The all-wooden RF-6B thus evolved into the composite T67, the aircraft with which Slingsby, in co-operation with U.S. manufacturer Northrop, recently beat off all-comers to supply 113 trainers to the USAF training programme in Hondo, Texas.

***Opposite:* the RF-47 is very obviously a Fournier design. *Above:* René Fournier in the cockpit of the prototype. *Below:* the second prototype under construction at Tours, using a new wood/carbon fibre composite which requires no autoclave.**

The aircraft to which French Government funds were diverted was less than successful, and it is obvious that Fournier is very bitter about the outcome, having received not a penny from the ultimate success of his original RF-6B design.

Fournier went on to produce several more designs, including the RF-8, an all-metal tandem two-seat version of the RF-4, which evolved into the RF-9. This was put into limited production by Fournier; only twelve were built. The RF-10 was a plastic/composite T-tailed version of the RF-9 built by another French company, Société Aérostructure at Marmande, thirteen being produced before production ceased and the design licensed to the Brazilian Aeromot concern, who called it the AMT-100 Ximango and built over twenty examples.

Enter onto the scene one André Daout, newly returned with his wife and son to live in Tours, having sold a very successful air taxi and aerial survey/crop-spraying business in French West Africa. Daout had logged over 5,500 hours of mainly bush-type flying—in an area the size of France which boasted just one (unreliable) VOR. He was introduced to Fournier by their mutual bank manager (also a pilot). Daout consulted at length with Fournier and, having done his own market research, decided to set up a new operation, with Fournier as technical consultant and a French freelance aeronautical engineer, Jean-Marie Klinka, engaged to do the aerodynamic and stress calculations. They would be working on a new Fournier design, the RF-47. The type number indicates that the new design (Fournier's twelfth prototype) is a two-seat derivative of both the RF-4 and the later, experimental, aerobatic one-off RF-7 design (currently flying in the UK as G-EHAP)—the RF-47 also includes some RF-6B features for good measure.

It has been determined by the French aviation authority FNA that some 1,600 training aeroplanes in France are due for replacement before the end of the century. The French government, being both airminded and supportive of the efforts of its own nationals, has indicated that a small two-seat French-produced trainer would be favourably received, although it was not willing to provide any initial investment, perhaps because of previous débâcles.

Through the enthusiastic commitment of André Daout an outside financier has now been found, and the first proof of concept (POC) example has been built and flown. The original design has subsequently been optimized for lightness and ease of production, using Klinka's IBM CATIA computer-aided design equipment.

The second example, in effect the pre-production prototype RF-47/02, is now well underway—in a small workshop on the predominantly military training airfield of Tours St Symphonerien—with Daout's new company, Arc Atlantique Aviation. However, the good burghers of Tours, for whatever reason, have not been very encouraging of the enterprise whereas, some 100 km further south, the Chamber of Commerce of Poitou-Charentes has extended the red carpet, offering new production facilities, start-up assistance and development grants. Guess where the new RF-47s are going to be built?

As a result of findings made during the initial test flights of the prototype, many improvements will be incorporated into the production versions, which will be powered by the ubiquitous Limbach engine. This VW-inspired powerplant now produces 90 hp and has a TBO of 1,600 hours, after which it can be service-exchanged for a zero-hour replacement for (at current prices) around £4,000. However the RF-47's most significant feature is the use of a new wood/carbon-fibre composite which requires no autoclave to cure, being bonded under pressure at 50°C. Used in stress-critical areas like the main ➤

spar, this new material has resulted in a weight saving of some fifty kilos over the all-wood prototype wing, while the tailplane weighs just five kilos in its bare state.

By making extensive use of the new material the series-production RF-47s should prove to be sparkling performers, if the heavier and slightly lower-powered prototype is anything to go by.

The opportunity to visit Tours and fly the prototype RF-47 came in winter—hardly the best time to attempt a flight test and photo session. However, after a frustrating couple of days waiting for the weather to clear, we were rewarded with what photographer Keith Wilson calls "f22 conditions"—and F-WNDF was wheeled out into the sunshine.

The RF-47 prototype: the walkround

Sometimes, when you first encounter a new aeroplane, its origins are blindingly obvious. Look at the F22 Pinguino (*Pilot*, July 1994); it shouts "Frati!" at you. The Fournier influence

***Right:* odd French 'day VFR' panel has neither AH nor DI, just an electric turn-and-slip. *Facing page:* 'a chunky little bird, looking just like a baby Slingsby T67'. Opening the one-piece canopy, which pivots fore and aft on a single strut, is 'a bit awkward—heavy and unbalanced'.**

of the RF-47 is another prime example. It's a chunky little bird, sitting perkily on a tricycle undercarriage and looking just like a baby RF-6B/Slingsby T67, while the lineage going right back to the first RF-1 is very apparent, especially in the wing planform.

For a pre-production prototype, Delta Foxtrot is very well finished, its gleaming cream and red colour scheme accentuating the trainer's crisp lines. Certain obvious features have carried over from earlier designs, including the single one-piece canopy, which on the RF-47 pivots fore and aft on a single support. When the canopy closes, this support leg retracts into a well on the turtledeck behind the cabin, faired in by a pair of neatly closing doors rather like an upside-down retractable nose-leg door. However the locking mechanism is rather clumsy, and when operated from inside the aircraft, also very awkward, and this is one of the many items scheduled to be redesigned. The second and subsequent examples will also incorporate, among other modifications, a wider cockpit, longer nose and detail improvements to the stiffener bracing inside the cockpit.

The 33-foot trapezoidal one-piece wing, apart from its new material, is of conventional wood/fabric construction, with electrically operated three-position plain flaps and pushrod-actuated Frise ailerons, which move very smoothly when operated by either of the dual control columns. In 'DF the fuel is held in two alloy wing-tanks aft of the main spar, but the second example is being built with the same capacity tanks (seventy litres, fifteen galls) located ahead of the spar in the 'D' box. The airfoil is our old but efficient friend the NACA 23000 series, going from a 23015 section at the root to the classic 23012 at the tip, with 2.4 degrees of washout in each wing. The trailing edge consists entirely of the ailerons and flaps, which must be stepped over to gain access to the wingwalk. Since the wing is only about eighteen inches off the ground at the root, this is not as difficult at it might at first appear.

The fuselage is a flat-bottomed, flat-sided affair with radiused corners and a flattened semi-circular turtle deck and tapers quickly to a rather attractive angular fin and rudder. The elevator trim tab is cable-operated, though on production models it will be electrically driven; it has no servo effect.

The spatted main undercarriage is a simple tubular affair, bolted directly to the main spar, with cable-operated brakes on the main-wheels, while the firewall-mounted nose-wheel is steerable through the rudder pedals. My first impression of the landing gear was that it appeared less than robust in the search for lightness. The undercarriage (especially the nose-wheel) may thus not prove as durable as one might wish, especially bearing in mind the rough treatment it is likely to receive at the hands of student pilots operating off the rough grass strips which pass as airfields at many French towns. But I could be wrong (and for the students' sake, hope I am!), and to be fair to Fournier, the demonstrated crosswind limitation is a relatively high 22 knots.

The POC prototype is powered by a Sauer (VW-based) engine producing a nominal ninety horsepower and turning a composite and wood Airplast propeller with an astonishing amount of blade twist, especially towards the hub—no doubt to aid engine cooling. Investigations into different propellers are currently underway for the production machines. The engine itself is very neatly encased in a horizontally-split composite cowling, with just a single fairly small exhaust pipe exiting underneath alongside the nose-leg, giving the aircraft a degree of quietude as judged by ground-bound listeners. However the pre-flight inspection requires eleven cowl fastening devices (four each side and three on top) to be undone before the top half can be removed—hardly an encouragement to a comprehensive check—and no access hatch is incorporated into the cowling to aid oil level checking and replenishment. Being designed for 'day VFR-only' operation, no landing light is fitted in the nose, though

the RF-47 does have wingtip nav lights and an anti-collision strobe.

Getting into the RF-47 can be a little tricky. The canopy is unlatched via a large rear-pivoting door catch, which extends outwards from just by the aft rear corner on the pilot's side. If you unlatch it first and two people lift the canopy over and backwards (the easiest method), you then have to do a sort of sideways limbo to pass this protruding handle in order to reach the cockpit without stepping outside the narrow non-slip walkway. I found that trying to open the canopy solo and from just one side while standing on the wingwalk was slightly awkward; it is quite heavy and unbalanced. How a petite French lady pilot would cope on her own I cannot imagine.

Once inside, the fixed fabric-trimmed seats (to be moveable on production versions) are fairly comfortable, while each control column sports a black moulded grip with a red PTT on top. In addition to imparting a more natural, even sporty feel, columns require less mechanical linkage than yokes and are thus lighter and cheaper to produce. Behind the seats is a usefully capacious flat baggage shelf, but I couldn't find any placard stating a maximum baggage weight.

The grey-painted instrument panel contains what the French quaintly term 'day VFR' fitting, which means no artificial horizon or DI, just a compass and turn & slip. In 'DF this is electrically-powered and supplemented by a separate slip ball below it. The other main gauges are an ASI (marked in kph, so my speeds below are converted by rounding off), altimeter, VOR, VSI and rev counter, which goes up to 3,500 rpm. The avionics sit in front of the P2/instructor, who also has six engine and systems health gauges in front of him, on the right of the panel. The magneto key lives above the throttle. There is a row of small but clear annunciator lights above the main instruments, and a row of switches—all clearly marked and activating such items as the strobe, electric fuel pump and nav lights—below them.

The flaps are deployed using a three-position paddle switch situated between the main dials and the radios. Click it down one stage and the flaps droop eighteen degrees to the take-off setting. Further depression takes them down to the forty-degree landing setting. The switch stays where it is put, and needs no more than the briefest touch to select a particular setting—other manufacturers, please copy! At either end of the panel are two rotate-to-operate fresh-air vents fed by two ducts, one either side of the fuselage. The cabin air/heat control, carb heat and choke (not mixture, this is a converted car engine) are all situated along the lower edge of the main panel.

Just below is a centre console with two fuel gauges and a combined fuel selector/starter button device. The vertical fuel selector must be turned through ninety degrees to draw fuel from either the left or right tank before the red starter button is revealed; in the *Fuel off* position it is impossible to press the starter. This is another simple yet effective safety feature which deserves to appear on other manufacturers' offerings.

The centre console extends from front to rear, dividing the cockpit. The T-bar throttle falls nicely to hand, with a friction nut on the passenger's side of the central spine. The aft console section carries the brake handle and parking lock, the pitch trim wheel and the sockets for the headsets. In theory, while this would seem to keep them out of the way, in practice I found the headset leads became entangled in the brake lever. The trim wheel was also a little too far aft for comfort, but I was assured that all these items are to be improved on production models.

My other criticism (also to be dealt with in later versions) concerns the long handle which protrudes forward between the occupants' shoulders. This is the internal canopy locking mechanism which must be pushed downwards once the canopy has been swung over and forward into place—again not easy with just one occupant. Two locking pins then secure the glazing via holes in the canopy frame; these must be checked as having engaged. I fear that considerable attention will have to be addressed to certain aspects of the cockpit ergonomics on production versions of the RF-47 if the aircraft is to become suitable for low-hour solo students whose attention is often diverted by nerves.

Flight test

I essayed two flights in the little RF-47, the first with Arc Atlantique's chief test pilot M. Robe. This was done in conditions too poor for photography, and consisted of a short cross-country to nearby Amboise, there to do some touch-and-goes. Tours, being an Alphajet-equipped ab initio military training establishment, permits no civilian training or circuits.

The RF-47 starting procedure will be familiar to pilots who operate a Limbach, and car drivers (becoming rarer) who operate a manual choke. When cold this is pulled to full *Rich* and the throttle pumped several times. The fuel selector is turned to the chosen tank, the battery master switch, alternator switch, magnetos and electric fuel pump all selected *On* and the red button depressed. After just a few blades pass the Sauer fires up and is allowed to warm for a minute or so at the choke-controlled high-idle. Once the temperatures reach operating limits the choke is slowly returned to the *Off* position, whereupon the engine ticks over at a smooth 750-800 rpm.

Touching the throttle for the first time, I found it to be ultra-sensitive at the lower settings, requiring care when taxying—an otherwise easy exercise with an excellent view in all directions except immediately rearwards. The brakes are smooth and powerful in operation, and when the park brake button was lifted to lock them for pre-take-off power checks, the aircraft held firm needing no manual assistance.

The run-up is conducted at 2,000 rpm and follows the standard fixed-prop procedure, with the first stage of flap deployed during the take-off litany. From brake release to the rotation speed of 105 kph (57 knots) took just over ten seconds, and at 110 kph (60 knots) the RF-47 fairly leapt off the runway, having proved simple to keep straight, up to that point. Immediately it became apparent that the prototype's gearing of the ailerons and elevators is just too high for student pilots, though for those with a sensitive touch it is a delight.

Climbing away initially at 120 kph (65 knots) required the ball to be centred with some right rudder (the VW turns the opposite way to a Lycoming or Continental) while the ➤

Fournier RF-47

(target design figures)

Dimensions	
Wing span	32 ft 10 in
Length	20 ft 6 in
Height	6 ft 10 in
Wing area	115 sq ft
Aspect ratio	9.4
Weights & loadings	
Empty weight	830 lb
Max auw	1,320 lb
Useful load	490 lb
Wing loading	11.48 lb/sq ft
Power loading	14.67 lb/hp
Fuel capacity	15 imp gall
Baggage capacity	Not stated
Limitations	+4.4/-2.2g
Performance	
Maximum speed	118 kt
Max cruise	103 kt
Economy cruise	97 kt
V_{ne}	146 kt
Climb rate	780 fpm
Stall, clean	43 kt
full flap	39 kt
Take-off roll	230 m
Landing roll	Not stated
Service ceiling	13,100 ft
Range (no reserves)	480 nm

Powerplant: Limbach VW-based engine producing 90 hp at 3,300 rpm. Production propeller, to be determined.
Engine TBO: 1,600 hours.

Manufacturer: Arc Atlantique Aviation. Address at time of writing: Aéroport de Tours, 37100 Tours, France. Tel: 00 33 47 51 25 64, fax: 00 33 47 54 29 49.

Price: expected to be approximately Ff500,000 ex-factory (£61,500 at current rate of exchange).

VSI showed a climb rate around 800 fpm (we were not at max gross weight). Once the flaps were retracted the climb speed was upped to 130 kph, whereupon the climb rate increased slightly before I levelled off at 1,500 feet, throttled back to the 2,800 rpm cruise setting and watched the ASI needle wind its way round the dial to settle just below 180 kph IAS.

Without headsets (the French seem to dislike them) the aircraft is noisy due to wind and engine noise, but not overly so. Wearing my 'green can' David Clarks, the noise level was reduced to just a muted hum, and the RF-47 became even more pleasant to fly. The outside visibility is superb, with little distortion through the complex curves of the one-piece moulded transparency.

The aircraft proved capable of being trimmed to fly hands and feet off for minutes at a time, even in the moderate turbulence we encountered—for such a light machine it is very stable.

I sampled several steep turns which required just the tiniest amount of rudder to support the nose, while the speed of the roll reversals (two seconds between sixty-degree banks either way), coupled with the lightness and precision of the ailerons, was so good that I enquired of the aerobatic capabilities. I was told that although it has passed its JAR VLA spin trials with flying colours and is stressed to +4.4/-2.2g, the RF-47 is not yet approved for even basic aerobatics. Knowing Fournier's earlier achievements in this field, I do not think it will remain thus restricted for long!

Stalls were wonderfully docile, both clean and with full flap, occurring at eighty kph and 72 kph respectively, with normal recovery procedure losing no more than a couple of hundred feet each time.

At Amboise we joined a busy circuit, and I flew a tight base leg. Closing the throttle on final did not result in the anticipated deceleration, however, and I was forcibly reminded of the RF-47's motor-glider antecedents; it has a glide ratio of 13:1. In order to slow down below V_f of 140 kph I had to sideslip hard to bleed off some speed. Both first and second stages of flap required little in the way of re-trimming, and the final stages of the approach were carried out at 120 kph, coming back to 110 kph over the hedge and touching down just under the hundred kph mark.

My first landing on Amboise's narrow tarmac runway could have been better, the very sensitive ailerons plus the crosswind turbulence causing some lateral pilot-induced oscillation and a one-wheel touchdown. Armed with this experience, I re-programmed Brain, re-set flaps (like that switch!) and re-applied power. The RF-47 tracked straight and lifted off without further drama, and I'm pleased to report my subsequent landings were considerably smoother. The aircraft is, however, notably slippery, and should teach good forward planning techniques in the circuit and letdown, while the elevator authority remains good even below touchdown speeds, enabling the aircraft to be landed properly on the mains, after which the nose-wheel can be lowered at will. The brakes can be applied firmly but carefully (to avoid skidding), whereupon the RF-47 slows pleasingly quickly.

The prototype's gleaming cream and red colour scheme accentuates the neat lines. Controls are 'crisply precise... the handling excellent'. At a 100-knot cruise the fuel burn is 'a miserly fifteen litres an hour—an astounding achievement'.

The following day, this time accompanied by André Daout, I was followed back to Tours from the photo-session (during which the RF-47 further showed its breeding by proving a delightful machine in which to fly formation) by the Cessna 172 cameraship, maintaining our pre-briefed formation speed of 165 kph. The Cessna, struggling to keep up, declared our speed on his ASI to be nearer 110 knots—in other words, the little RF-47 prototype is quite a bit faster than it appears to its pilot, at least at higher speeds, due to an under-reading ASI.

The target empty weight of the production model is 830 pounds, with a max auw of 1,320 pounds, giving a useful load of 490 pounds. Full fuel and oil will account for 120 pounds, leaving 370 pounds usable, or sufficient to upload two twelve-stone occupants and 34 pounds of flight bags and paraphernalia. To carry such a load at a cruise of around 100 knots, behind what is basically a much-uprated VW engine burning a miserly fifteen litres (three gallons) per hour, and capable of flying over 400 nm with reserves, is an astounding achievement.

To enhance this with such crisply precise controls, excellent handling characteristics and attractive lines is a true affirmation of the skill and design flair of the septuagenarian René Fournier—a charming, unpretentious Frenchman and a creative and artistic genius who not only plays the violin, but also just happens to design extremely well-tuned aeroplanes.