



Not quite what it appears to be: While the RF4's motor glider appearance was essential to its original French certification with a single-ignition engine, it is more aeroplane than SLMG



Fournier RF4UL Kitplane

A small group in France is working to relaunch René Fournier's ever-popular, and super-efficient aerobatic single-seater as a kit for homebuilders

Words & pictures by Bob Grimstead

For more than forty years, the Fournier RF4D has been regarded as the world's finest economy single-seater. Fourniers were fully-certified production aeroplanes which handled and performed brilliantly, but unfortunately that meant they were never cheap. In 1968 a new RF4 cost \$5,500, but by 1972, towards the end of its 155-airframe production run, this had risen to \$8,500 – when a brand new, two-seater, Bellanca-built Aeronca Champ sold for just \$4,995. Nowadays Fourniers only rarely change hands. When they do, prices around £25,000 and more are not unheard of.

On the other hand, there are always a few damaged or dismantled airframes around. These sell more cheaply because of the astronomical cost of a professional rebuild. For many years the Fournier Forum's most often-asked questions have been, "Where can I get a new one?" "Does anybody make a

kit?" and "Are plans available?" Until recently, the answers were invariably negative, but with the active assistance of designer René Fournier, a small band of Frenchmen is now determined to make new, kit-built Fourniers accessible to all. The operation is currently in its early stages, but at the recent Gap-Tallard meeting of Club Fournier International (CFI) convened to celebrate the fiftieth anniversary of the first Fournier's maiden flight, the brand-new Fournier RF4UL was announced, and a complete prototype airframe was available for scrutiny.

Like most knowledgeable pilots, these guys are Fournier enthusiasts. They include Jean-Michel Daubagna, an ex-Air France pilot who owns both an RF4D and an RF5 two-seater; Michel Fert, a former employee of René Fournier's original production company, Alpavia, and regarded as their mechanical genius; RF3 owner 'Ski' (another Frenchman,

but with an unpronounceable Polish name) and Olivier Petri, a former violin and harp maker, turned skilled model maker of the very highest order. With the others' help, Olivier built the prototype's predominantly wooden structure in three months of six-hour days. He eventually expects to be able to turn out at least ten kits per year.

The RF4UL looks the same as the original production RF4, and it has identical dimensions and areas. However, its economy will be improved to just 8 litres per hour, stall speed will be a remarkably low 33 knots and its glide angle will be increased to 22 to one. With a better power-to-weight ratio, its climb angle is likely to be around 700 feet per minute, while maximum and cruise speeds will be much the same as before at around 125 and 100 mph.

More importantly, this new variant incorporates numerous important improvements and minor modifications in the light of forty years and hundreds of thousands of hours of Fournier operations. Most significant of these is its mass. Modern technology has enabled a 25-per cent weight loss without spoiling its performance, economy or +6/-3g aerobatic limits.

Why the big weight reduction? Not only because it can nowadays be achieved, but because French aircraft with a maximum take-off weight below 300kg no longer have to go through the time-consuming, laborious and therefore expensive process of

testing and proving they meet EASA certification requirements. René Fournier has been involved in this new project from the beginning, and says that if this design code had existed in the nineteen sixties, his original RF4s would have been built to meet it.

As every designer knows, whenever you beef-up a structural component, the airframe's weight increases, demanding more strength and thus even more structure. By reversing this process and establishing the weight and strength of every re-designed component, the RF4UL's empty weight has been minimised.

Starting with that most important of structural members, the original RF4's heavy, multi-laminated Douglas Fir main spar has been replaced by a wood/composite spar having a deep strip of directional carbon fibre incorporated within its laminations, and tapering from over 9mm thick at the root, to just 0.3mm at the tips. This allows the spar to be less than one-third the width and weight of the 9cm original for precisely the same aerobatic G limits.

As with its predecessor, the 11.2:1-aspect-ratio wing's torsional strength is provided by D-section plywood leading-edges and triangular root fillets, but by using Okumé ply rather than the original Finnish birch, further weight has been saved. The former, production RF4's wing and tail ribs were plywood, built-up Sitka spruce assemblies, while the new model's lighter ribs dispense with the ply side-plates. Since the slimmer spar makes these ribs a little longer, a new set of rib jigs had to be built, but these have all been

maintenance of the original RF4s was the length of that nearly forty-foot, one-piece main spar. The later, tandem two-seat RF5 had folding wings, but the fold was not at its semi-span, making it still quite wide to hangar. The new RF4UL's wings fold at their strongest point, the rib incorporating the aileron's inboard end, the outboard spoiler fitting and the outrigger leg socket. This brings the wingtips within an inch or so of the fuselage sides, so its folded span is less than twenty feet. Also, the new model's root fittings will be

lightweight Dacron fabric and sprayed with long-lasting two-pack polyurethane paint.

The original Fournier's monowheel retractable main undercarriage was based on three substantial aluminium castings, but these have proven prone to cracking over the years, so the new substitute is CNC machined from 2017 aluminium and 25CD4S stainless steel plate. Compression springs replace the original, perishable rubber bungees, while tension springs assist retraction and extension.

The complete assembly weighs a mere 10.5kg, compared to the



Panel mock-up: by select use of electronic multi-function units, the space is left uncluttered and weight kept down

simplified, so the entire wing can easily be whipped off in under an hour for road transportation or longer-term storage.

Throughout the RF4UL's new structure, every component uses the lightest appropriate type of wood for each application, and weight has further been saved by skinning the fuselage

original's 16.8kg, and is fastened to the airframe by shear bolts, so that the primary structure is protected in the event of a heavy landing.

The proprietary aluminium mainwheel has a low-profile, wide-tread tyre for year-round soft-field operation. An Eringer hydraulic disc brake with parking lock is operated by additional spoiler lever travel, rather than the original, rather cumbersome system of a separate parking brake lever under the instrument panel. The castoring and steerable tailwheel will be carried on a long glassfibre spring.

The airframe's entire wooden structure barely tips the scales at all at a mere 46kg, with the outer wing panels weighing a featherlight 3kg apiece. Engine cowlings, wing-tip, tail tips and fin- and wing-root fairings are lightweight carbon/epoxy composites, and the one-piece folding cockpit canopy will be formed from PVC tetraphthaline and is available in two styles, either like the original or mimicking a Cassutt's.

The new cockpit has been made a little longer for today's bigger pilots, while the contoured seat will be both adjustable and easily removable. The rudder pedals will also be adjustable, to cater for people of all builds, and pilot heights of at least 1.95m will be practicable. As with the original, the ailerons, elevators and spoilers will operate by torque tubes or push-pull rods, while the rudder will remain cable-operated.

Analogue instruments will be limited to the altimeter, ASI and compass, supplemented by a simple slip ball. A Dynon EFIS will provide

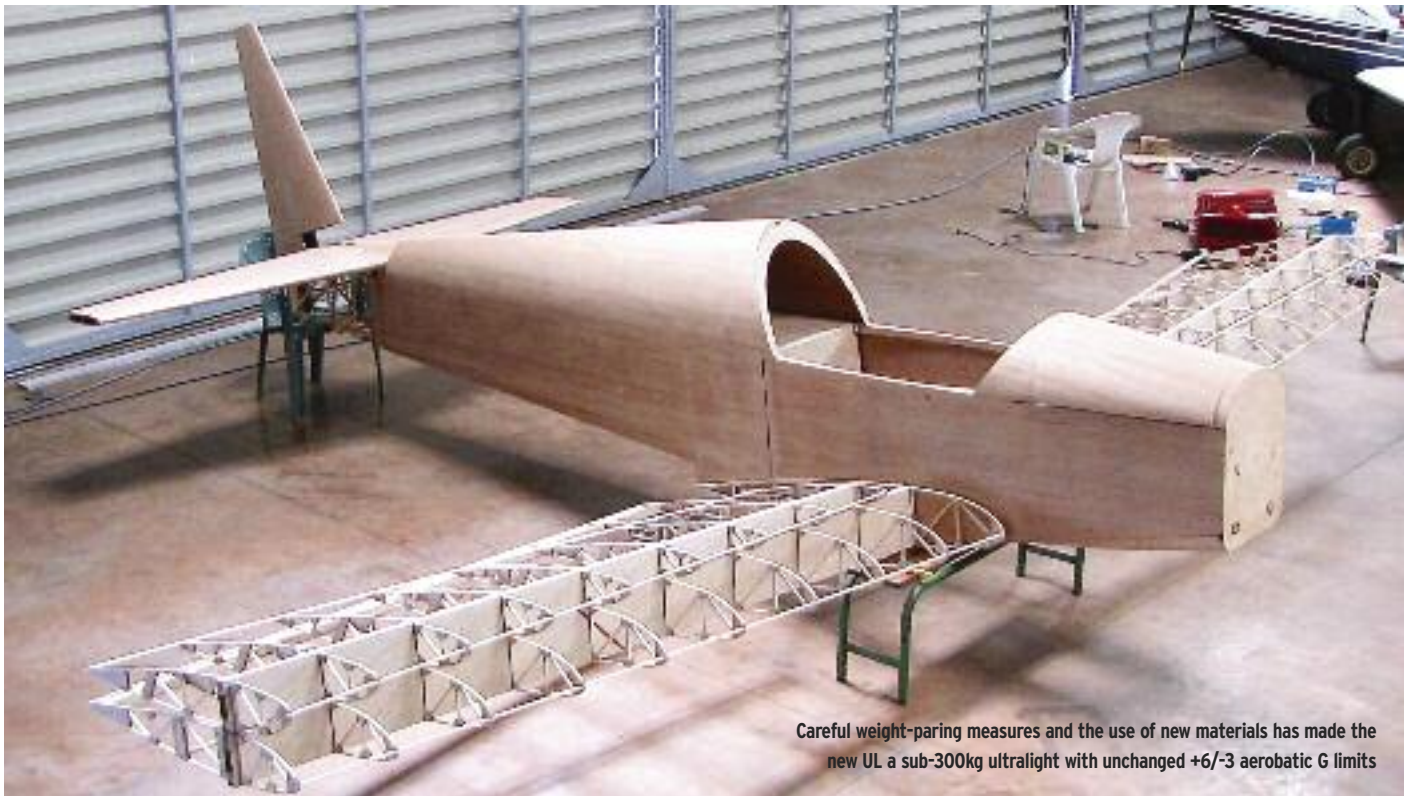
"The airframe's entire wooden structure barely tips the scales at all, at a mere 46kg, with the outer wing panels weighing a featherlight 3kg apiece"

completed. Obviously, the highly successful NACA 23012/23015 aerofoils have been retained, with the original four degrees of dihedral and four degrees of washout. This wing section is ideal because it was perfected for sailplanes, and its convex under-surface remains efficient during inverted flight. Oh, and these new wings fold. A significant drawback to storage, restoration and

with just two sheets of ply, rather than the four that were originally scarfed together. Utterly reliable and infinitely-lived Resorcinol adhesive has mostly been used, with the specialised (but very expensive) Araldite 1420A for gluing the carbon-to-wood joints in the main spars. The wing-root walkway is reinforced by carbon fibre honeycomb rather than plywood for added lightness. Everything will be covered in a super-



The UL's wings fold mid-span, making the aircraft more easy to hangar than past Fourniers



Careful weight-paring measures and the use of new materials has made the new UL a sub-300kg ultralight with unchanged +6/-3 aerobatic G limits

everything else in the way of flight instruments, including a GPS moving map display. A huge amount of engine instrumentation (equivalent to displays from up to 32 conventional dials) will be displayed on a Flybox mini EIS. This much simplified panel will halve the original's weight, while providing far more information.

Other improvements not merely associated with weight-saving include incorporating the mainwheel's cover into the fuselage structure, so that the fuselage's forward decking can be made quickly removable. This allows instant and easy access to the normally invisible, far side of your instrument panel. This compartment will contain a portable thirty-litre fuel tank with quick-disconnect fittings (like an outboard motor's) complete with carrying handle, so you can save money by strolling along to your nearest garage. There is also space in here for the additional safety of a ballistic parachute.

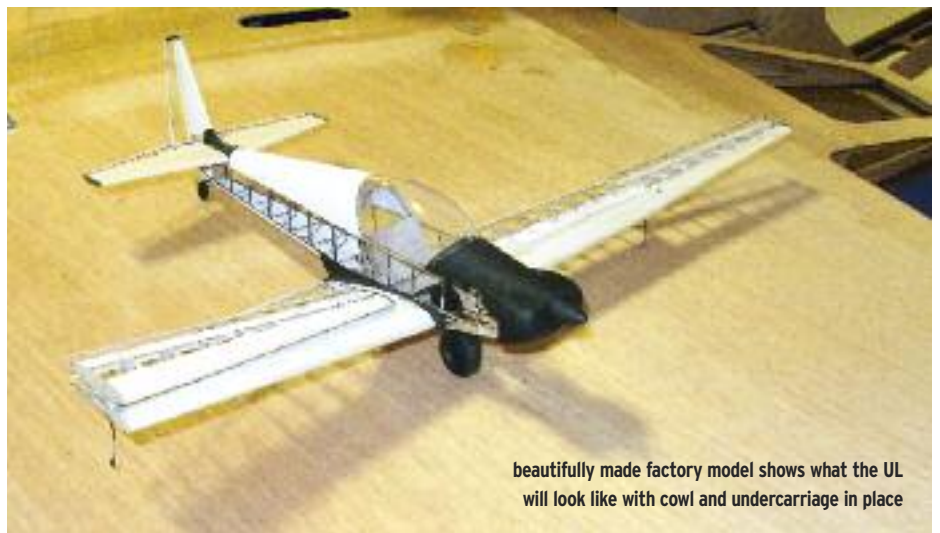
Like the RF4UL's instrumentation, the eventual engine will probably be optional, but this prototype will initially use an air-cooled, four-stroke, overhead-valve, 630cc V-twin with integral starter and alternator. This is made by a double-barrelled American corporation that is virtually a household name (but no, its initials are not H&D). Several versions of this engine are already commonly used on French microlights, including Michel Colomban's promising Luciole. Like these, the Fournier engines will be tuned by a local concern to provide more power, and geared down with a two-to-one toothed belt drive to a specially made lightweight Duc SWIRL propeller. Nominally this standard engine develops 25 horsepower, but after French 'engine

sorcerors' Bautek have finished lightening the flywheel, increasing the compression ratio, fitting harder valve springs etc, it produces an impressive 100kg of static thrust at 4,200rpm (2,100 propeller rpm). To put this into perspective, it has been calculated that previous RF4s needed just 20kg of thrust to stay aloft, while the RF4UL should need only 15. All the other 85 are available for climb performance, which ought to be impressive!

At 22kg with all accessories, this engine is significantly lighter than the former Volkswagen's 56, so the new engine will need longer mounts, but since the originals were barely 5cm long, that should present few problems. Let me here inject a small note to correct a popular, ill-founded misconception. Don't be fooled into thinking the RF4 was 'just a motorised sailplane'. It never was, nor was it

ever intended to be a self-launching or touring motor glider. It has always been a high-efficiency, multi-role, aerobatic personal aeroplane which simply took advantage of a certification loophole to get away with single ignition for its Volkswagen engine. Its classification as 'avion/planeur', or 'aeroplane/glider' was a mere bureaucratic convenience. Nowadays, with both modern Volkswagens and the RF4UL's new engine having dual ignition, it can shrug off that SLMG/TMG slur.

The RF4UL prototype's first flight is expected early in this year, with kits perhaps being available in 2012. There is not yet a web site, nor any other means of communication, but further information on Fourniers in general and their aerobatic abilities in particular are available on: www.cfiamerica.com and www.redhawkduo.co.uk



beautifully made factory model shows what the UL will look like with cowl and undercarriage in place