Groppo Trail

Practicality Italian style – a brand new design that takes a fresh look at what today's pilot wants in a utility aircraft

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TRAIL

There are so many small aeroplanes and microlights available these days around the world, of all different configurations, that it's unusual to find a new type which doesn't appear to draw on some other designer's efforts. Designs such as Dean Wilson's Avid Flyer and Chris Heintz's Zenair CH701 STOL are still being closely echoed by numerous 'new' types almost 30 years after the truly innovative aircraft that inspired them.

The Trail, designed by Italian Nando Groppo, is one machine that is refreshingly new rather than a copy of something that went before. Starting with a clean sheet of paper, Groppo has developed a tandem-seat, high-wing design with many unusual features aimed at providing a sportplane with greater utility and durability than competing types, ideal for farm-strip operation. The Trail is a rugged-looking little aeroplane of all-metal construction, with not a piece of carbon fibre or honeycomb sandwich in sight. Styling is angular rather than curvy, cocking a snook at the plastic fantastics and emphasising the Trail's carefree utility flavour. Like the Super Cub and Citabria, the Trail is flown solo from the front seat and despite its metal rather than fabric cladding, the personality of the Trail seems a bit like a cheeky pipsqueak younger brother to these much loved larger types.

As with any new design of kitplane, gaining UK approval is a major undertaking and only a small proportion of the products that are developed make it onto the LAA's list of accepted types. Key to the Trail's future in the UK is that it has been taken up by former SportCruiser agent Graham Smith of Dover-based Sprite Aviation. Graham has already had the experience of taking the SportCruiser through the LAA process and then supporting kit builders with parts and advice. Concerned by ever-increasing sophistication and price levels in the kitplane market, Graham identified the Trail as a design that would be fun to fly, could be marketed at a moderate price more suited to today's difficult financial climate, but would give nothing away in terms of safety or practicality. Graham's ambition is to supply the UK version of the kit at a price that will allow it to be built for no more than the cost of a very basic rag-and-tube microlight. Initially being developed as an SEP aeroplane at 520kg mauw, Graham is also working on weight reductions to allow a basic version of the aircraft to be approved as a 472.5kg microlight with ballistic parachute.

Signature feature of the Trail is the one-person wing-fold, which can be completed in just a minute or two, without tools. Likewise, the tailplane can be folded quickly by removing just four bolts. Unlike the Avid derivatives, whose wings fold backwards while remaining in the horizontal position, the Trail's wings have been cleverly arranged to twist through 90° before swinging back, so the folded width of the aircraft is much more compact and less vulnerable to damage either in storage or road transit. Unlike most folding-wing designs, with the Trail there's no prohibition on folding the wings with full wing tanks, saving a huge amount of hassle with jerrycans and funnels, and making the daily wing-fold a truly realistic part of the Standard Operating Procedures. With hangarage fees making up a large proportion of the average owner's fixed annual costs, taking up less space in the hangar or even parking it in the garage at home over the winter could be a passport to significantly cheaper flying.

Unlike some of the competition, where they remain coupled up, the Trail's aileron controls need to be disconnected before folding the wings and connected again after unfurling them, but this only takes seconds, thanks to the use of quick-release pins. More importantly, a cable-controlled catch arrangement allows the person at the wingtip to manoeuvre the wings single-handedly without the need for a helper to deal with the wing-root fittings. Once the wings are securely latched into the flight position, the pilot can move from the wingtip to the root end and secure

Wing-fold really is a one-man, two-minute job

In its element, the utilitarian Trail on a farm strip the pins through the main and rear spars before moving on to the second wing.

Construction-wise, the Trail's flying surfaces are of conventional riveted sheet aluminium format. The fuselage is more unusual, having a front cage which reaches from firewall to the rear of the cockpit, which is welded from square section chrome molybdenum steel tubing. Aluminium alloy sheet is blind-riveted to the frame to provide a partially-stressed skin, and behind the cockpit this extends aft to form a riveted aluminium rear fuselage incorporating a much smaller steel cage at the very rear end. The fuel tanks are nylon/epoxy units, located in the wing-roots and arranged so that the contents of the tank are directly visible to the pilot. The main gear is a simple one-piece bent aluminium alloy unit, bolted to the fuselage frame with four large cap screws, and sports large-diameter balloon tyres intended for rough-terrain use. Hydraulic disc brakes are used, operated by toe-brake pedals in the front cockpit – additional toe-brakes on the rear pedals are an option.


Neat Rotax 912S installation. Sauer VW is a likely option

The Trail has been designed primarily for the industry-standard Rotax 912, 912-ULS and Jabiru 2200A engines. Graham is also developing the option of fitting the German air-cooled, flat-four Sauer engine, a long-established VW derivative which could potentially result in a further substantial cost saving, in an engine configuration already familiar to many UK flyers and already well proven on many other small aircraft and motorgliders.

The Trail is to be marketed in the UK as a so-called flat-pack kit, in which the welded steel fuselage forward and aft frames are supplied pre-prepared but you have to build the fuselage by joining the frames with longerons and skinning the entire assembly. The flying surfaces and tail also have to be assembled from pre-fabricated components, hopefully not too onerous a task as the parts are all pre-drilled and self-jigging, but nevertheless the Trail builder will have enough to get his teeth into to feel that he has genuinely built his aircraft himself, and avoids any difficulty in proving that the aircraft complies with the 51% rule. As a further cost-cutting initiative, Graham is also promoting a do-it-yourself, one-coat paint system for the Trail, easily applied using a roller, which produces a smart finish with the minimum of fuss and for those without their own spray facilities or skills, saving the eye-watering cost of a professional paint job.

UK PROTOTYPE FLIES

After a first tentative sighting at Friedrichshafen in 2009, the LAA's involvement with the Trail started with an invitation from Nando Groppo to visit his works, located on a small airfield in the province of Pavia about 20 miles south-west of Milan. This trip, undertaken by LAA Design Engineer Andy Draper in early 2010, started the ball rolling and allowed Italian-speaking Andy to discuss the aircraft with its designer, see the Trail in build at the factory and carry out an initial evaluation of the type's handling qualities.

Later, after a deal of paperwork had been checked, Graham Smith was OKed to build a UK prototype Trail to move the project forward to the next stage. Work started in the autumn of 2010 and was completed in early 2011. Graham had a bit of a head start with this because his initiation was with a unique 'fast build' rather than a standard kit, plus his SportCruiser experience means he is very much up to speed with the Rotax 912-ULS engine installation, wiring and fitting instrumentation and so on. The Trail was brought to Turweston for final inspection in February, and as Graham was a bit rusty on tailwheels I was honoured with the task of carrying out the first flight – an experience that was completely without drama, as befits such a carefully constructed machine. That first exposure showed that the Trail was great fun to fly and the only significant defect was in directional stability, which was a bit neutral – a trait previously reported by Andy Draper on the Italian-registered demonstrator.


A STOL aircraft it may be but the Trail exhibits a good turn of speed for touring

Since that first flight, Graham has been busily working away on improvements to the aircraft, partly to satisfy LAA requirements and partly for his own demands. The most obvious change is that the area of the fin has been increased by adding a large tip-piece which extends over the top of the rudder, promoting more positive directional stability. The fin leading-edge and dorsal strake have also been re-profiled with a greater leading-edge radius, which has further improved the fin's aerodynamics, wool tufts showing that the original rather sharp edge promoted airflow separation – a feature, incidentally, which Andy Draper had queried in his original review and a good example of LAA Engineering adding value to a design as a by-product of the approval process.

The long-term structural integrity of the aircraft has been increased by reinforcements to the wing carry-through structure in the cabin top, and additional gussets will be added at the rear spar connections in due course, which will further beef up that area. Detail changes to the design of the swivelling wing-strut attachments are also being tested by Groppo, at the LAA's request, which will remove any doubts about the longevity of the airframe in these critical areas.

A more subtle change is that the aeroplane now has an electrical warning system, which sounds a horn in the cockpit if the master is switched on when any of the four wing retaining pins are absent or not fully home. While deriggable and foldable aircraft are nothing new, the one-man-rig arrangements mean that when the wings are first spread, they support their own weight by themselves before the pins are installed. This introduces a risk that if distracted at this point in the procedure, the pilot might taxi out and attempt to take off without the pins in place, with predictably disastrous results. This risk has been addressed by Graham's very neat addition of four microswitches in the wing-roots which the pins depress only when fully engaged.

The opportunity to fly the Trail again came in early September, shortly after the aeroplane appeared in the New Types park at the LAA Sywell rally. Walking up to the Trail it seemed much as before – still the same cheeky lines that had so quickly endeared themselves to all of the Turweston folk, still the eggshell grey paint and hi-viz fluorescent orange trim emphasising the fibreglass engine cowl, wing and tail-tips.

Simple glass fibre cowlings are easily removed for daily inspection

Microswitches trigger an audible alarm if spar pins are not fully home

The Trail has a single, large, top-hinged door on the right hand side of the cockpit, giving access to both front and rear seats. The door area is big – too big to safely open in flight, accidentally or otherwise, so three interlinked door latches are fitted, operated simultaneously by a single, substantial lever. Another small latch allows the door to be held open while the aeroplane is on the ground, but as Graham has found, even starting the engine with the door open risks damaging the door's hinges.

The Trail's cockpit is neat but not plush, the exposed steel framework in full view. The seats are tubular-framed with taut fabric tapes stretched crosswise on them, like a lawn chair. The front seat tips forward to let the passenger get on board, the front and rear seats being close-coupled, pitched tighter together even than a Piper Cub.

The person lucky enough to occupy the front seat gets a great view out, his or her eye line being high enough to see clearly over the round-topped front cowling and far enough forward to see a good way round in front of the leading-edges of the wing roots, so you can look into a turn to clear the sky of other aircraft. The one in the rear seat has the pilot's head squarely in his twelve o'clock, and the twin shoulder straps of the pilot's harness stretched in front of their eyes, but this is not overly intrusive and while slightly cramped lengthwise, the passenger's position in the tandem-seat Trail is at least not short of elbow room, and the overall impression is that it's less cramped than many a narrow side-by-side two-seater.

Turning our attention to the controls, the stick and pedals are non-adjustable but nicely placed, for me at least. The dual lever-type throttles are on the left-hand side of the cockpit, and again, can be operated with the pilot's arm in a comfortable position. The flaps are electrically operated using one of those very neat pre-selector switch units on the panel, where you can move the flap to any of its four positions by toggling the sprung-central lever switch the appropriate number of times up

All-metal airframe is angular but not unattractive

Front seat hinges forward for easy access to rear through very large door

Plenty of 'glass' and the forward position of the pilot makes looking into the turn very easy

or down, the selection being identified by a column of four LEDs. The electric elevator trim is activated through a pair of buttons on the top of the stick grip. And there's a pair of inline fuel shut-off valves in the wing-roots, normally left open to feed from both tanks simultaneously. The vapour return line bleeds surplus fuel from the fuel pump continuously back into the left tank, so when both tanks are filled to the brim, initially at least it's as well to feed from this tank only, otherwise there's a risk of the bleed-back fuel overflowing the left tank.

Carb heat is supplied courtesy of a Skydrive anti-ice system, which diverts hot water from the radiator to the carburettor bodies. Pilot comfort is cared for by a push-pull cabin heat control, operating a flap in the firewall which allows air heated by the engine coolant radiator to flow into the pilot's footwell.

RESPONSIVE TO CONTROLS

Starting the Rotax 912-ULS fitted to Graham's aeroplane is standard for type, liking choke and a completely closed throttle from cold. Graham's engine has the 'soft start' module fitted to the ignition, which helps avoid the 912-ULS's normal 'thump' on first firing up. The generously-sized throttle lever provides nice precise control of the power setting – and with steerable tailwheel, well-placed toe-brakes and clear view out of the front and to the wingtips, the Trail is very easy to taxi among other parked aircraft.

The Trail seems to track very straight on take-off, and with a 100bhp motor pulling an airframe weighing scarcely over 600lb, with first stage of flap the tail is light straight away and at solo weight the aircraft surges forward to unstick in about 50 yards into a light breeze, this despite the fact that the two-bladed, fixed-pitch Woodcomp propeller is holding the full-throttle rpm down to just 5,000rpm (max continuous is 5,500) at which the 912-ULS power curve shows the engine producing less than 90bhp. As with any Rotax 912-ULS in a lightweight airframe, there's a tendency to turn left when the throttle's opened up that has to be countered with right rudder, but surprisingly, this seems much less noticeable in this tailwheel-equipped craft than in competing nosewheel machines. Leaving the ground at just over 35kt, it seems to climb away quite happily at 43 indicated, but we let the speed rise to 50-55 for best rate and to have speed in hand in case it goes quiet up front. Climb rate settles to around 1,200fpm. Two-up, the ground run's about twice as long and she climbs at around 900fpm.

During the climb out I'm struck by the excellent forward view over the slim cowling, despite the steep angle of climb, and the overall responsiveness to the controls, which makes the Trail feel very much a point-and-go machine, almost like a single-seater. On the other hand, the aircraft has unusually strong longitudinal static stability for an aircraft of this class. I was expecting to find that this became almost neutral with two up, because adding a rear seat passenger inevitably moves the C of G quite a way back, but Groppo has clearly done his sums right about tailplane sizing because even in this configuration the

Wings folded. No problems with draining fuel as in some older folding-wing designs

Trail is strongly pitch-stable. Thanks to this stability, the electric elevator trim is positive but not sensitive, and the task of trimming to remove stick force is effortless – there's none of the poking at the switches backwards and forth trying to find the sweet spot you need, which is often the first indication of a neutrally stable machine. There's not a great deal of trim change when the flaps come up, either, contributing to the overall ease of operation.

Levelled off in the cruise, the Trail seems to crack along very happily at 90kt with 4,750rpm set, burning 14lph, seemingly in a very nose-low attitude. Flat out she will do about 110kt, but the low-wing loading of the aircraft makes such speeds impractical in any but the smoothest of air. Graham finds an 80kt cruise at 4,250rpm provides a good economy setting, allowing more time to enjoy the passing countryside and consuming just 12lph. Originally the aircraft's thin aluminium skins and side windows were prone to drumming at high air speed, but Graham has fixed this tendency to the point where I find it no longer noticeable.

Moving on with our whistle-stop tour of the aircraft's handling characteristics, we test the effect of gently yawing the aircraft with the rudder pedals while holding the ailerons neutral. As you would expect with the high wing configuration, the aircraft responds by dipping a wing in the same direction as the yaw, indicating positive dihedral effect. This positive yaw-roll coupling means the pilot can manoeuvre the aircraft in and out of gentle turns with his feet, if for example his hands are occupied dealing with charts and so on, and is one of the many handling quality ingredients that add up to make what we subconsciously perceive as 'normal' handling. From the certification point of view, it also allows an alternative means of controlling the aircraft about the roll axis if the aileron system should ever jam or become disconnected in flight.

The next test of lateral stability we do is to hold a steady heading sideslip using opposite aileron to balance the turning effect of the rudder, and then release the stick to let the ailerons neutralise and see whether the dihedral effect is strong enough to lift the depressed wing. The critical difference between this test and the previous one is that it adds into the equation the effect of the ailerons failing to accurately self-centre on release, which provides an additional roll moment, which the dihedral effect may or may not be powerful enough to counter. With the Trail, stick release in either a left or right sideslip does result in the aircraft rolling back through wings level 'with' the held-on rudder, as desired. Trying this again (putting a finger alongside the stick as a centre datum), shows that on release the stick is returning essentially – as good as exactly – to neutral, a good result. (The same test, done the previous day on a high-wing aircraft with narrow-chord flapperons had resulted in the stick coming back to a point almost two inches from central, causing a 'soft' ill-defined neutral and less positive recovery response because the dihedral effect had to overcome the action of the still partially deflected flapperons tending to hold the low wing down.)

DIRECTIONAL STABILITY

Looking now at the directional stability, it will be interesting to see what differences the changes to the fin have made. Our first test, from level flight at a slow cruise speed, is to progressively depress one rudder pedal and note how the foot force that has to be applied varies. The aircraft is forced to more and more pronounced yaw angles, up to the point where full rudder is on and the aircraft is flying at its maximum yaw angle. Pedal force should increase progressively at higher angles and there must be no 'lightening off' tendency at higher angles indicating that the rudder may be close to 'rudder lock', that is, a tendency to move to full deflection of its own volition. Having assessed yaws in one direction, the other pedal is tested. (In a propeller-driven, single-engined aircraft it's common to find the results to left and right are rather different because of the effect of spiralling slipstream, etc.)

With the original fin, the Trail was rather prone to yawing off of its own accord and needed frequent minor adjustments on the pedals to keep the ball in the middle in flight. Rudder pedal forces required to yaw were very light and if yawed through a large angle, the aircraft tended to stay where it was put without any self-centring tendency, having to be put back in balance by positive pilot input. With the new fin extension fitted, the directional handling has been transformed and the directional stability and control are now good. When you release the rudder in a sideslip, the nose doesn't 'click' straight back to straight ahead like some aircraft do, but pedal forces behave themselves and it self-centres slowly, that's all that's needed. Too much directional stability makes it harder to keep the aircraft going where you want in a crosswind landing, and less willing to sideslip when you want to drop off a little height on the approach. Which would be a pity, because the Trail sideslips beautifully and this is a very useful feature of any aeroplane intended for farm strip flying.

Another useful test of the lateral-directional qualities of an aircraft is to attempt a turn using the stick alone, while leaving the rudder pedals free. Whether the nose swings initially around the horizon 'with' or 'against' the bank is a good measure of the aircraft's directional stability and the aileron's adverse yaw, and a good indicator of how much care is going to be needed to co-ordinate aileron and rudder in a turn. In the Trail, we find that in banking, both left and right, the nose starts to swing almost instantly in the direction 'with' the bank input, indicating that the directional stability, even with the rudder free, is sufficient to counter the aggravating effect of adverse yaw. This test shows that the Trail will not be too much of a handful for pilots who are converting from other modern aircraft which enjoy similar user-friendly characteristics, and from a certification standpoint, the aircraft would be perfectly flyable (though uncomfortable) if the rudder controls were to become disconnected or jammed neutral in flight.

Neat panel and basic but comfortable cockpit. KISS

In the stall, the Trail's parallel chord wing and blunt-nosed wing leading-edges make for very docile characteristics, showing great reluctance to drop either wing, even when abused with rudder or aileron inputs putting the ball out. Indicated speeds at the stall are around 30kt, less with flap, although there's clearly a pitot-static position error taking effect here. When a wing-drop is eventually induced with full back stick, it falls only through 15° or so and then enters a rocking motion, which ceases as soon as you let the stick start to come forward. Stalls in turns and under accelerated flight have yet to be checked, but all the indications are that the Trail is a well-mannered machine at the stall.

Time to land, and it's good to find that even in the forward C of G solo configuration, the elevator trim has just about enough authority to trim out on the approach with full flap, which seems very steady but totally controllable trundling down final at 45-50kt, still with a good forward view over the nose allowing full sight of the strip ahead. The descent rate with full flap is not huge but sideslipping soon wipes off any surplus height. Graham reports that full flap does make it difficult to three-point the aeroplane power off and solo, because you run out of back stick, but this can be avoided by carrying a little power through the flare. On touchdown, any wayward directional tendencies can be quickly nailed with a dab of toe-brake. She rolls to a halt in very little distance.

So what's still to do before the Trail can be added to the list of LAA-accepted types? While it's already been spot checked as described here, Graham's Trail is being taken to Bicester in the next few weeks to undergo its formal flight test evaluation in the hands of John Brownlow, who as he has no previous experience of the aircraft or its modifications, will be able to give us his truly independent view of the effectiveness of the finalised mod state and compliance with the CS-VLA flight requirements. Meanwhile, Groppo's technical team in Italy is carrying out additional load tests called for by CS-VLA on its sacrificial structural test airframe, which fortunately still survives intact after completing the test programmes for approval as a European microlight. The UK version of the build manual and pilot's operating handbook also have to be finalised. Once these activities are complete, and any outstanding mods are embodied on Graham's UK prototype, if all goes to plan the initial full Permit to Fly will be issued to G-RPPO. Once the build manual is issued, it will be possible to register further projects.

To sum up, I'd say that providing the manufacturers can negotiate the remaining certification hoops, the Trail seems a very practical little aircraft ideally suited to farm-strip type flying, with performance and handling characteristics that will not disappoint. The co-ordination of the flying controls and levels of stability about all axes make the Trial very pleasant in manoeuvre but also a stable platform in cruise, and given the need for standard taildragger skills the Trail is easy to take off and land. A nosewheel version is also planned, although initial approval efforts have concentrated on the tailwheel model.

Oh yes! The name! In Italy, the aircraft is called the Trial – T R I A L – which seems to suggest either an endurance test or a legal wrangle, neither of which are that appealing. So it became 'Trail' instead, as in 'trail bike', which seems to fit in well with the balloon-tyred, off-tarmac aspirations of this cracking grassroots funster. ■

GROPPO TRAIL

DETAILS

Top: Nando Groppo proves his confidence in the strength of the Trail's tailplane
Middle: good-sized flaps reduce landing speed
Bottom left: high-quality wheels with hydraulic disc brakes
Bottom right: throttle lever falls comfortably to hand

SPECIFICATIONS (ROTAX 912-ULS)

PERFORMANCE
Max speed: 110kt
Cruise: 80-95kt
Climb (solo): 1,200fpm
Climb (duel): 900fpm

DIMENSIONS/WEIGHTS
Wing span: 8.51m
Wing area: 10.2m^2
Length: 6.2m
Folded width: (tailplane not folded) 2.72m
Folded width: (tailplane folded) 1.8m
Max gross weight: 520kg
Empty weight: 290kg
Engine: Rotax 912UL/912ULS, Sauer 85hp

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