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# Bristell's Taildragger

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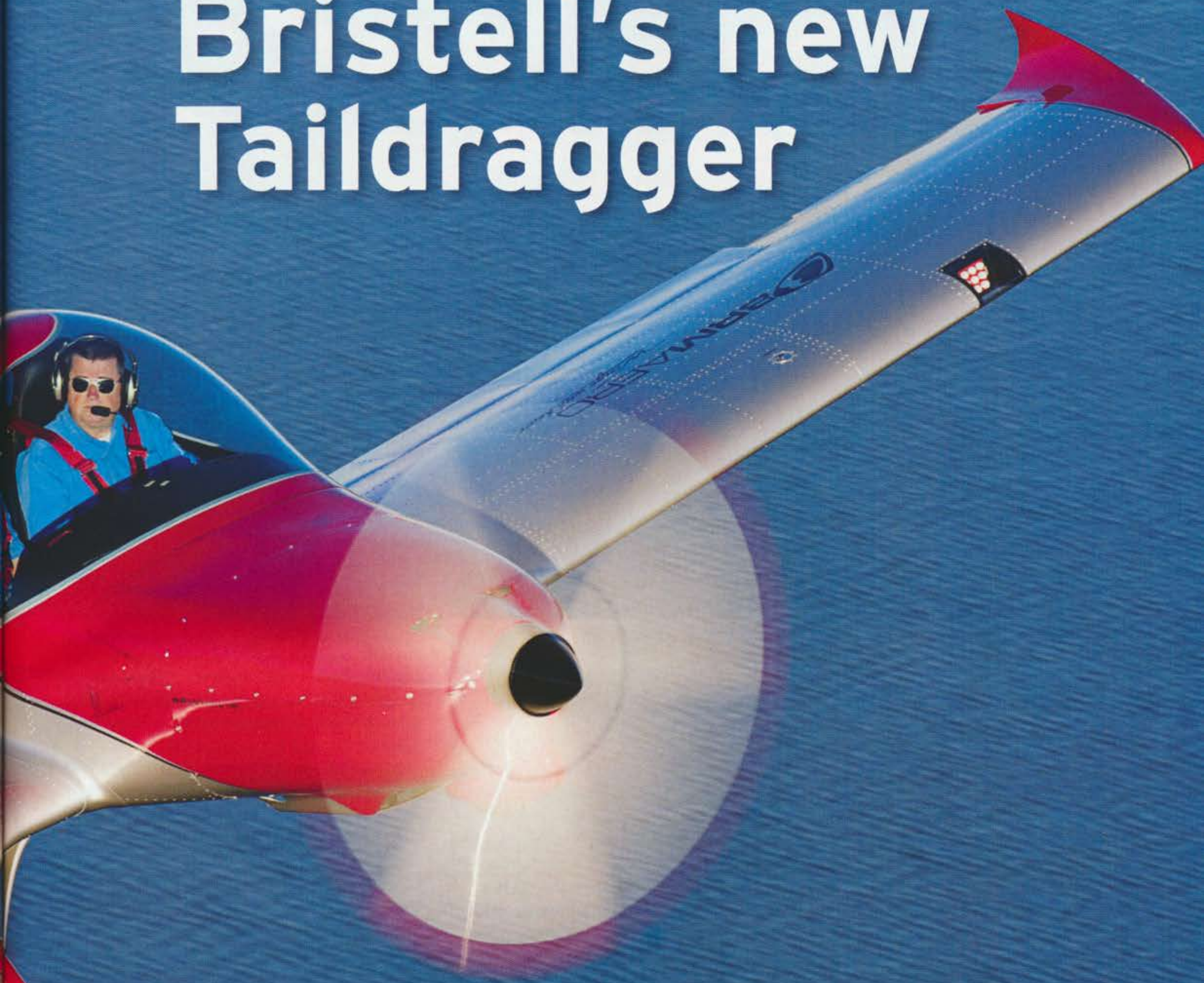
All three wheels simultaneously kiss the concrete with a gentle 'chirp' and I can't help but grin. Just why the simple act of landing an aircraft neatly is so satisfying is hard to describe, but it's irrefutable that if you're in a taildragger it feels even better!

Of course the above is very much a personal opinion, and entirely subjective, but just like Editor Philip and regular contributors Bob, Nick, Colin and Steven, if I'm flying a small, fun aeroplane then I do prefer the third wheel to be at the back. Whether it is because most of the fun aeroplanes are taildraggers, that they are better 'off piste', often slightly faster (the Texas Taildragger 152 conversion is a good example) or it's purely for the aesthetics, we like taildraggers. And yet this is actually counter-intuitive: the tailwheel configuration has more disadvantages than benefits – for example the field of view is poor when taxying and all tailwheel

# Bristell's new Taildragger



**Bristell improves its already excellent US LSA and UK kitplane by moving the third wheel to the tail**

**Words** *Dave Unwin* **Photos** *Jim Koepnick*

aircraft are inherently directionally unstable on the ground. And the instability is exacerbated when a powerful engine turning a large propeller is fitted. This may be an extreme example, but it is quite probable that more Messerschmitt Bf109s were lost in takeoff and landing accidents than in combat!

In fact it is undeniable that for most applications the tricycle undercarriage is inherently superior – which is why probably at least 95% of all aircraft manufactured after 1960 have nosewheels. Yet surprisingly, until about the mid-1930s practically every aircraft built was a taildragger, and it wasn't really until the sixties that the tricycle became the undercarriage of choice for all but a few specific applications. These days the tricycle undercarriage is king, which is why of the forty-plus LSAs I've tested over the last ten years practically all (with the exception of the various Cub-like iterations) were 'nosedraggers'.

PHOTO: JIM LAWRENCE

## *A stunning sculpture in scarlet and silver... easily one of the best looking LSAs*

Consequently the Bristell Carbon TDO (TDO stands for taildragger options) really caught my eye at this year's Sebring LSA Expo in Florida. A stunning sculpture in scarlet and silver, from the tip of the very sharply-pointed spinner to the top of the sweptback fin it was easily one of the best looking Light Sport Aircraft at the show – and it's a taildragger! I just had to fly it.

Starting at the spinner (which really is extremely pointed) power is turned into thrust by a three-blade, electric variable-pitch Fiti propeller. I was instantly confused by this, as under US LSA rules the prop is supposed to be fixed pitch. However, Bristell USA's John Rathmell explained that as the operating switch is forward of the firewall (and thus inaccessible in flight) it's allowed. The logic here is that if you're thinking about taking off from a short runway at a hot 'n' high airfield on a windless day you select 'climb', while for most operations the 'cruise setting' is more than adequate. Of course, if you build it as a UK kitplane, you can have the switch in the cockpit.

The engine is – almost inevitably in the Light Sport world – a 100hp Rotax 912ULS. Access to the engine is excellent: the upper cowling can be quickly removed for a thorough inspection, while the oil and coolant levels can also be checked via a small hatch on the top. Cleverly, the only tool required to change the oil is a screwdriver (to remove the upper cowling) as the oil tank has an integral drain valve.

Other neat ideas are that the master cylinders for the hydraulic brakes are on the engine side of the firewall next to the battery, the coolant reservoir blow-off valve is designed to vent the corrosive coolant overboard and the voltage regulator is mounted upside down (to prevent corrosion caused by water ingress). The fuel is contained in a pair of sixty-litre fuel tanks in the wings.

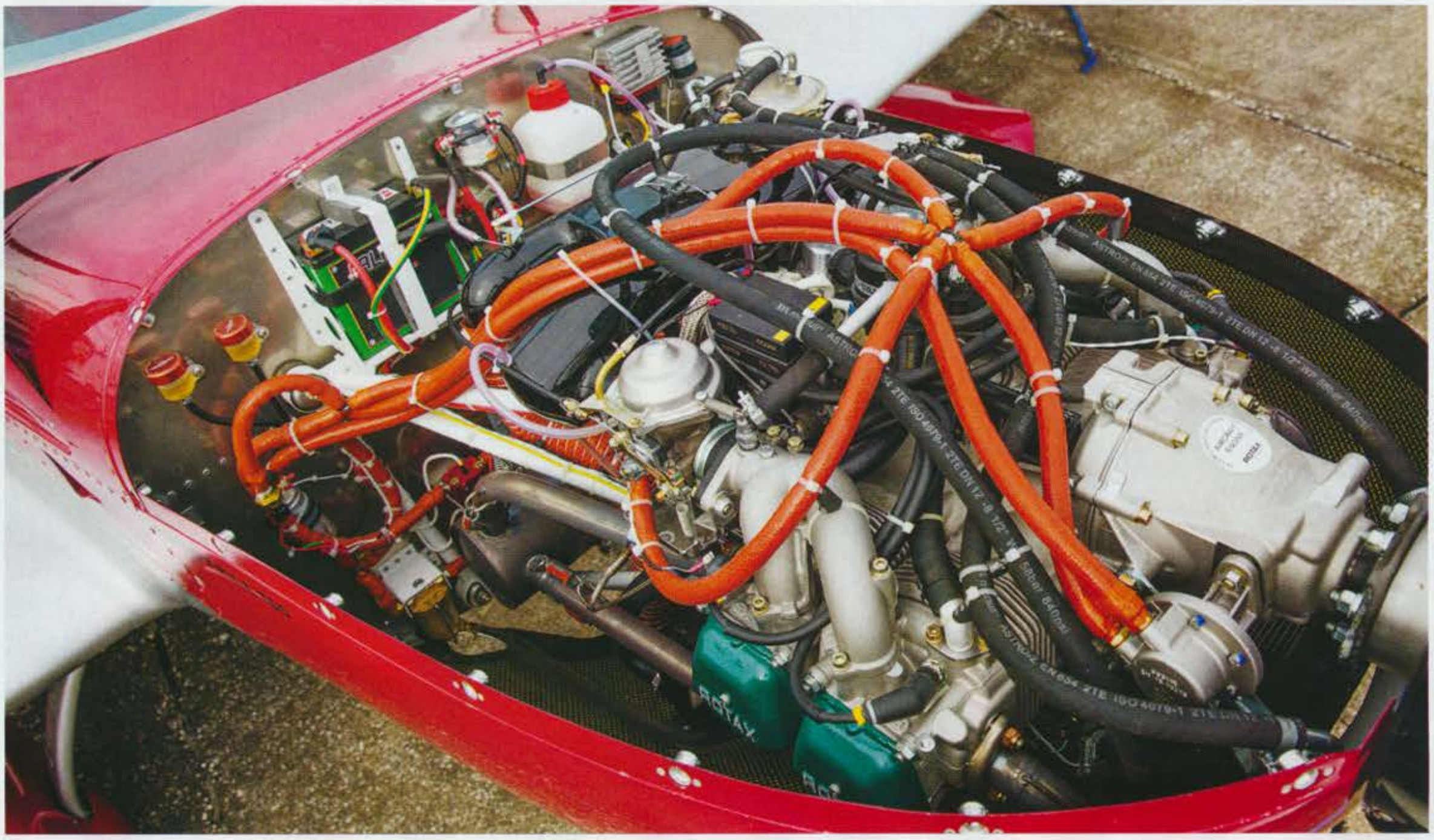
Studying the robust-looking undercarriage reveals that the mains have Beringer hydraulic disc brakes, are covered by close-fitting spats and carried by a composite spring arrangement. All well and good, but I really was rather surprised to note that the good-sized tailwheel neither steers nor locks, but only castors.

The constant-chord, cantilever mainplane has a small amount of dihedral and large LED landing and taxi lights recessed into the leading edges of both wings. The ailerons are relatively short in span and broad in chord, and there are electrically actuated, single-slotted Fowler flaps on the trailing edges. Gracefully upswept wingtips carry strobe and position lights.

Aft of the cockpit the fuselage tapers towards the tail, where a small dorsal strake grows seamlessly into an elegantly swept back fin and big, broad-chord rudder. The low-set tailplane carries a large constant-chord elevator and is fitted with a Flettner-type trim tab. Pushrods actuate the elevator and ailerons, with cables for the rudder, and electric motors for the flaps and elevator trim.

A particularly noteworthy facet of the Bristell is that it is made from 6061-T6 aluminium (most metal LSAs use 2024). Although 6061-T6 is a harder material to work with, it does offer significant advantages, the principal one being weight-saving. As it is more corrosion-resistant than 2024, it doesn't have to be to be anodized and there's no need for sealant between the sheets. Of course, composites are also used widely; the seats and engine cowl use Kevlar, the canopy frame is carbon fibre and the rudder skin a fibreglass sandwich. The test aircraft is the 'Carbon Edition', which makes greater use of carbon fibre and shaves about eight kilos off the empty weight.

Cockpit access is excellent. Being a taildragger it's an easy step up from behind the trailing edge onto the wide

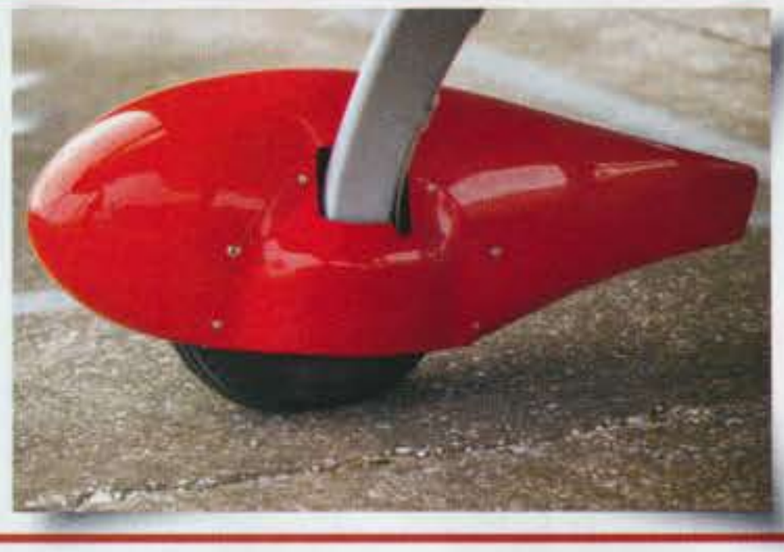


**Opposite:** we may be biased, but we think the Fastback looks far more handsome in taildragger form

**Above:** while a hatch allows the oil and coolant levels to be checked, the top cowl is easy to remove

**Right:** nice details include the spat fairings and neatly clipped in place brake lines

**Far right:** the multiple LED landing lights are powerful and durable, unlike single filament bulbs

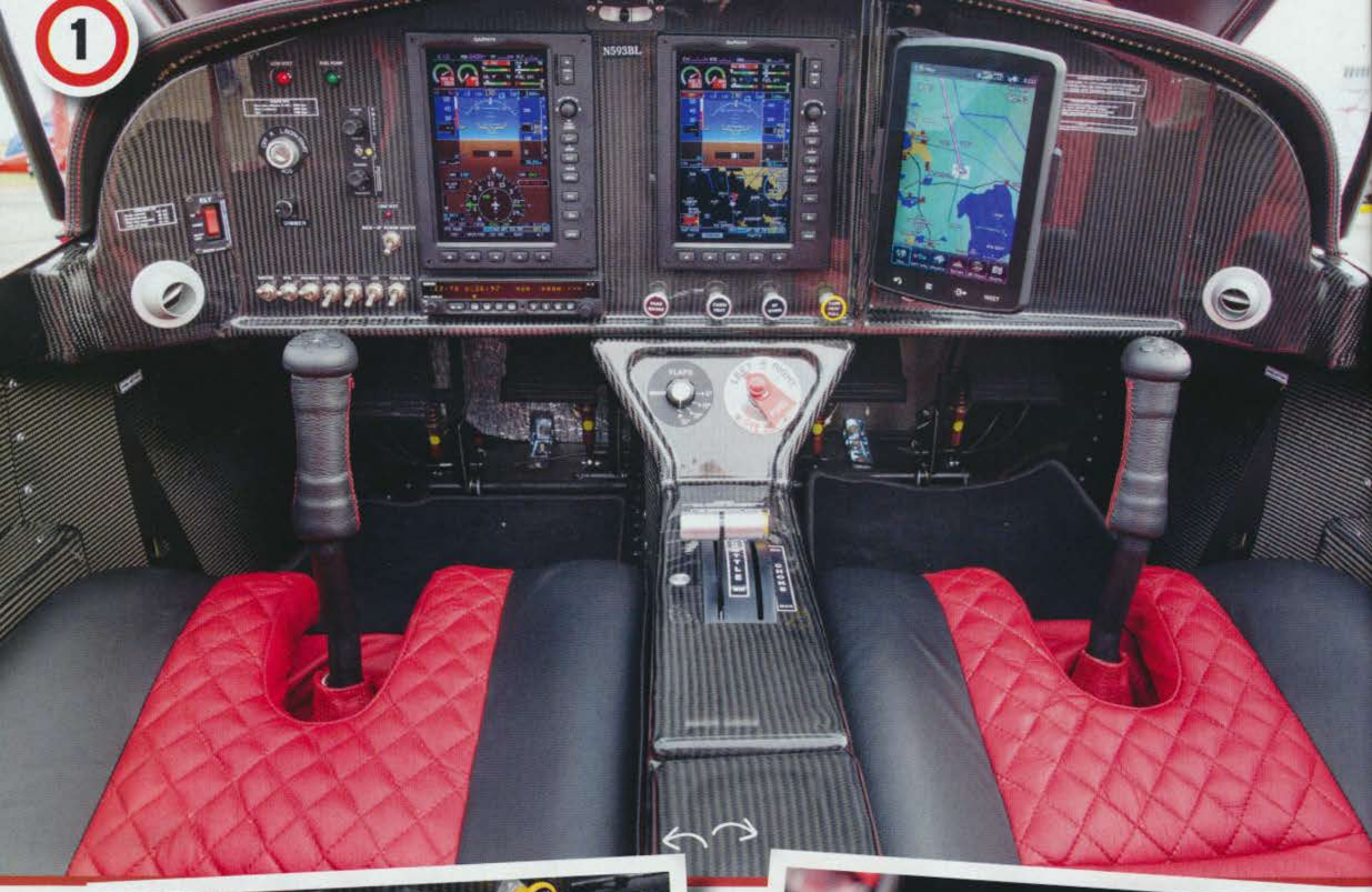


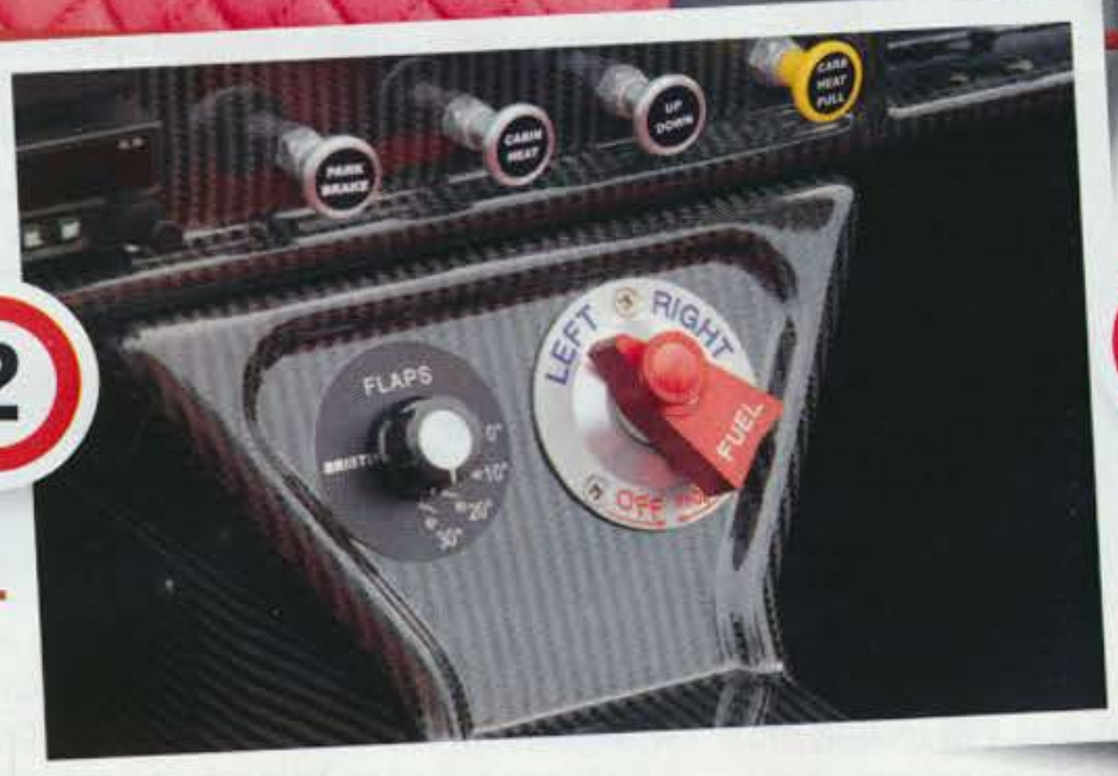
wingroot walkway while the big, forward-opening canopy is well supported by gas struts. Stepping down into the huge cockpit (an impressive 1.3m wide at the shoulders) you can brace yourself on a handhold between the seats, while when climbing out there are two useful handholds built into the glareshield.

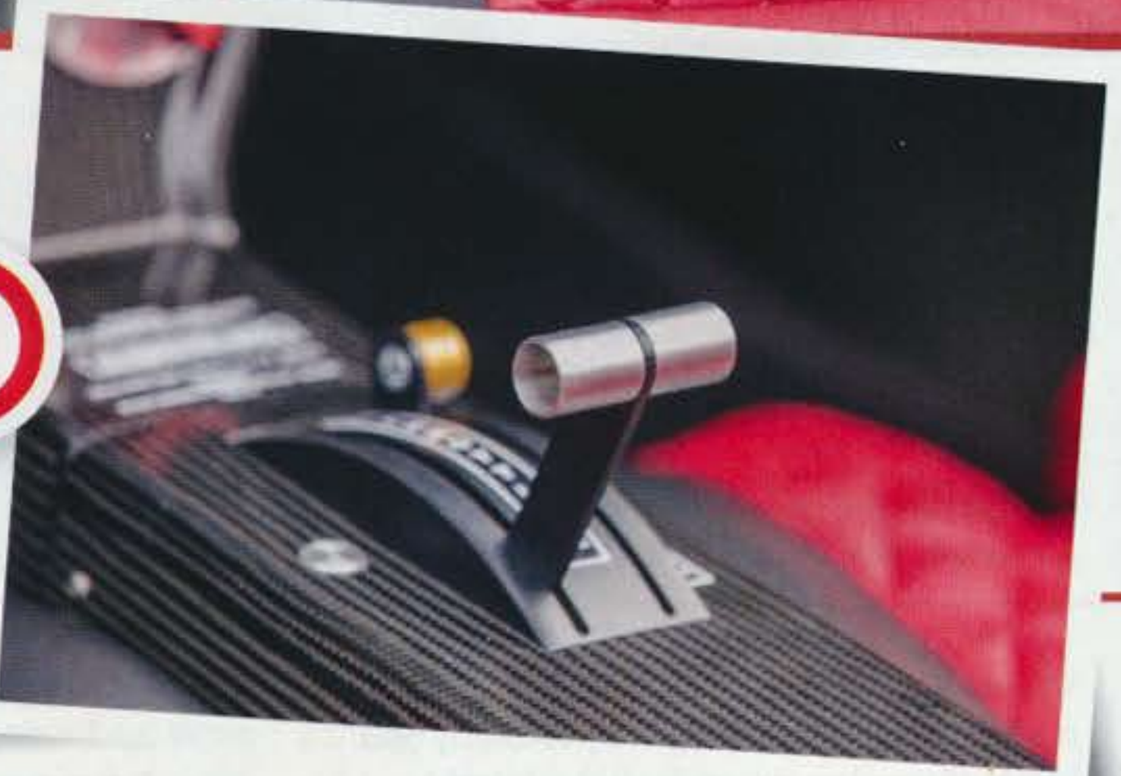
Behind the seats is a large baggage bay which can carry up to 15kg and is accessible in flight. The rudder pedals adjust over a wide range but the comfortable seats are fixed (they can be adjusted for height, but only on the ground). This allows them to be very strong, but (and particularly when on the ground in the three-point attitude) I was glad I'd stuffed an extra cushion behind me.

Shutting the canopy is simple – just pull it down until the gas struts can no longer support it and it drops into place and latches automatically. The panel is huge, but in this US LSA form not as well laid-out as it could be. In common with more and more aircraft that I'm testing for *Pilot*, it has no analogue instruments at all. Instead, all the flight, engine and navigation information is displayed on two Garmin G3Xs (new aircraft now have touch-screens) that are arranged in 'portrait', with a Garmin SL30 transceiver under the port one. However, neither is directly in front of the pilot. Instead, this space is used for a slightly untidy collection of toggle, rotary and rocker switches and some warning lights. It could – and should – be a lot better. I'd move the port G3X so that it is directly in front of the pilot, and also either fit guards around the toggle switches or replace them with rockers, as the current arrangement is a little too prone to being damaged by a wayward boot. The controls for the park brake, cabin heat, demist and carb heat could also be better designed. Currently they're four small, round plungers, and I think a better arrangement would be to make the park brake square and the heater controls triangular, use a hexagon-shaped plunger for the choke and relocate the carb heat next to the throttle. I'd also like the flap selector to be flap-shaped too. Here, it is a rotary switch (it looks a bit like the selector on an old-fashioned washing machine) and has four settings; 0, 10, 20 ➔

***The big, forward-opening canopy is well supported by gas struts***




**1:** a very attractive looking panel, even if the screens and vulnerable switches are oddly positioned in this US LSA model

**2:** easily confused parking brake, heater and carburettor hot air controls – and that 'washing machine' flap selector!

**3:** nice detail – the proper, T-handle throttle lever and orange-topped choke lever, sharing a central quadrant

**4** lots of (real) carbon fibre weave, red leather and fancy red stitching lend a luxury sports look to the cockpit

and 30°. In fairness – and despite my criticisms – its not a *bad* cockpit, just not as good as it could be. (The reason I get a little hung-up on cockpit ergonomics is that I often fly several different types a day, and I'm easily confused!) I did like the iPad holder, but think it should be mounted on the door of a good-sized glovebox. Between the seats is a centre console that carries a big T-handled throttle and the choke lever. Buttons for the electric pitch trim (and optional aileron trim) are built into the stick-top.

With John in the other seat, ninety litres of fuel and no baggage we are about 38kg below the 600kg MAUW, so with the Rotax emitting its usual muted whine, I release the park brake and set off for the runway. Almost immediately I know that the extra cushion was a wise choice. The field of view is so good that only slight S-turns are needed, while the toe-operated hydraulic disc brakes are powerful without being 'grabby'.

It being quite early in the morning, the air is cool and still with barely a zephyr troubling the windsock. As the temperature is around 15°C, the pressure 1013.1 and Sebring's elevation only 62ft the ambient conditions are pretty well ISA.

Conscious of the castoring tailwheel, I bring the power in slowly but there's no difficulty tracking the centreline of Runway 36 as the aircraft accelerates. Lift-off occurs at just under 50kt, while the initial rate of climb is an impressive 900fpm at 62.

Even though it's early in the day it's a show morning and the radio is alive with traffic inbound to Sebring. This brings my attention to one other thing: as good as the field of view is, it could be better. I think that the canopy should be completely clear and incorporate a fabric concertina-type sunshade. The current arrangement doesn't offer enough shade in the cruise, but does rather restrict the upward field of view.

We rendezvous with the cameraship above Lake Istopoka and soon get a fine set of pictures in the can, before heading away from Sebring's busy skies so I can concentrate on assessing the aircraft without having to dodge show traffic.

The first facet I'm eager to examine is the directional stability. When I tested the nosewheel version for the Spring 2012 edition of *Pilot*, I found that the directional stability was somewhat 'soft' at high yaw angles. The nosewheel strut and spat were both quite large and, having a lot of keel area in front of the centre of pressure, had a detrimental effect on the directional stability. As expected, the TDO's directional stability is significantly stronger. However, by contrast it is just barely positive laterally (almost bordering on neutral, and essentially the same as the nosewheel variant) while longitudinally it is not quite so positive – probably because altering the undercarriage has shifted the C of G slightly aft. Nevertheless it is still positive, and the aircraft returns to the trimmed speed from a ten-knot displacement after four long-wavelength/low-amplitude phugoids.

Slowing down for some stalls and slow flight confirms that the TDO is as well-mannered as its tricycle undercarriage sibling. It remains completely controllable well into the stall, which occurs at around 40 to 42kt, flaps up, and about 32 with full flap. This almost seems a little *too* slow, and I think that the numbers I record may well be influenced by position error. Nevertheless, the TDO still stalls at very low airspeed and is reluctant to drop a wing – although as there is no artificial stall warning system and the natural pre-stall buffet is very subtle, I do wonder if perhaps some sort of warning system should be incorporated if Bristell has its eye on the lucrative training market. (Back on the ground, John explains that the G3X has an optional A o A display/stall warner).

Moving onto some general handling with some steep turns and 'lazy eights' I soon remember why I was so impressed back in 2012 – this really is a sweet-handling flying machine. The controls are crisp, powerful and well harmonised, with low breakout forces. The field of view is good and the balance between stability and control – or, as I prefer, control and stability – really is very good indeed. The electric elevator trim is nicely geared (the trick is to just 'blip' the button, not press and hold) and only small amounts of rudder are required to keep the slip-ball centred.

**The TDO is as well mannered as its tricycle undercarriage sibling**

Satisfied that the TDO flies as nicely as the nosewheel variant, I move on to one of the areas where the inherent flaws of the tailwheel undercarriage always reveal themselves; landing! With four long and, more importantly, *wide* tarmac runways to choose from, Avon Park presents plenty of opportunities to land in crosswinds from both left and right, enabling me to embarrass myself and scare John – so we set course for there.

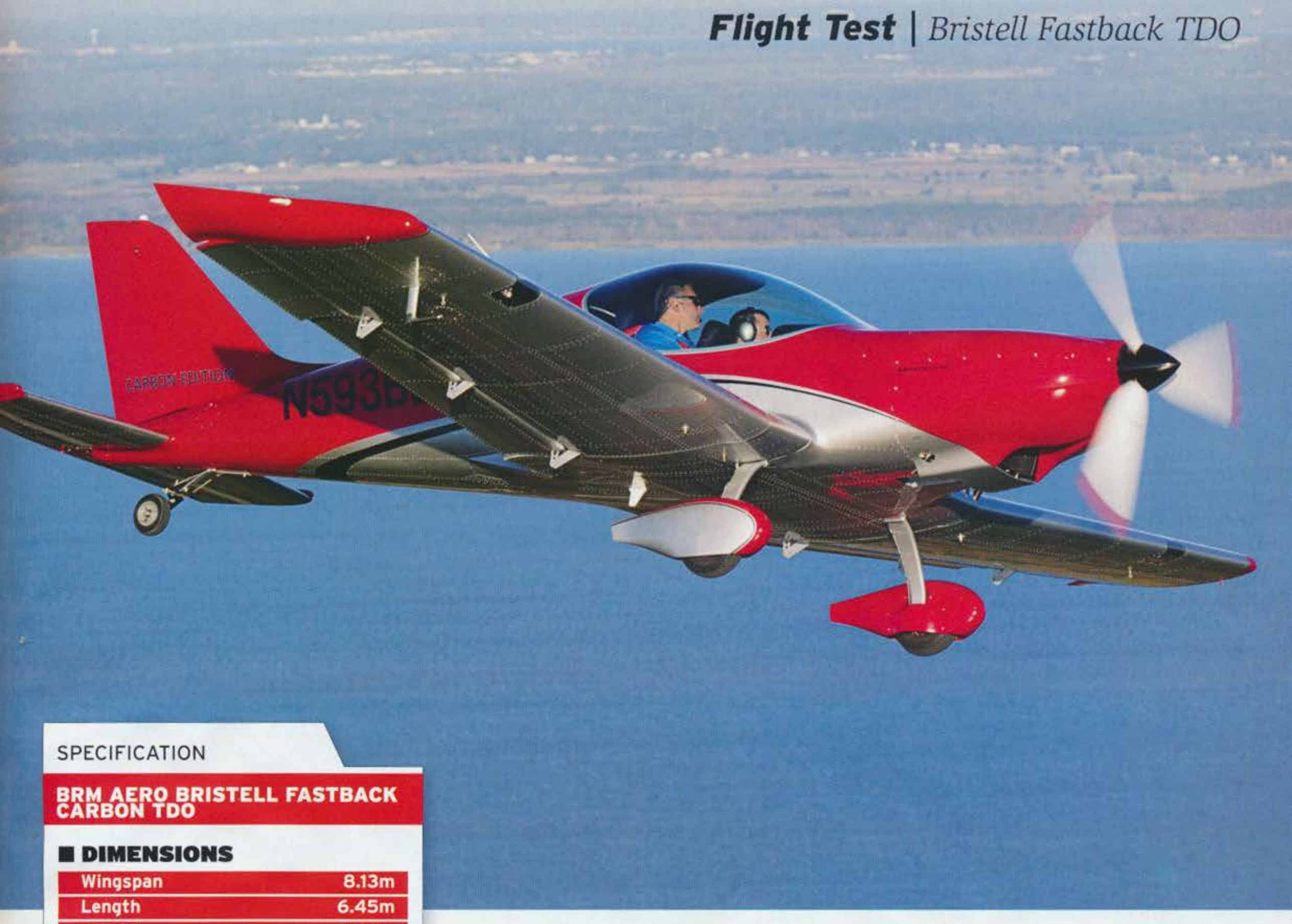
Remembering that I'd examined the nosewheel version's cruise speed at 3,000ft, I level out at that altitude, open the engine up to 5,500rpm (the 912's 'max continuous') and trim forward. The speed tape soon settles on the LSA legal limit of 120kt IAS, which is two knots faster than the nosedragger at the same altitude. I'm impressed, but John says that if we were allowed to use the variable-pitch prop we'd see another ten knots.

As METO (maximum except take off) is a rather thirsty power setting, I pull the throttle back to 4,800rpm. This is a very comfortable rpm for a 912, the fuel flow drops to around 18 lph while the IAS is still over 100kt (104 to be precise), which equates to a TAS of 110. Those big fuel tanks mean that legs of around 600nm are possible, with VFR reserves. At low power settings the endurance is a real test for the bladder and buttocks – around ten hours!

Overhead Avon Park we can see that the northerly wind has freshened while we've been flying, and will generate a crosswind from starboard on Runway 28, and a more interesting one from port on 05. Any idea of landing on either 10 or 23 is instantly



PHOTO: JIM LAWRENCE




SPECIFICATION

## BRM AERO BRISTELL FASTBACK CARBON TDO

### ■ DIMENSIONS

| | |
|---|---|
| Wingspan | 8.13m |
| Length | 6.45m |
| Height | 2.28m |
| Wing area | 10.50sqm |

### ■ WEIGHTS AND LOADINGS

| | |
|---|---|
| Empty weight | 294kg |
| Max AUW | 600kg |
| Useful load | 294kg |
| Fuel capacity | 120 litres |
| Baggage capacity | 15kg |
| Power loading | 8.04kg/kw |
| Wing loading | 57.14kg/m2 |

### ■ PERFORMANCE

| | |
|---|---|
| Vne | 155 kt |
| Cruise | 110kt |
| Stall | 32kt |
| Climb | 900fpm |
| Take off (to 50ft) | 250m |
| Land (over 50ft) | 300m |

### ■ MANUFACTURER

BRM AERO Ltd.
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686 05 Uherské Hradišt
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### ■ UK AGENT

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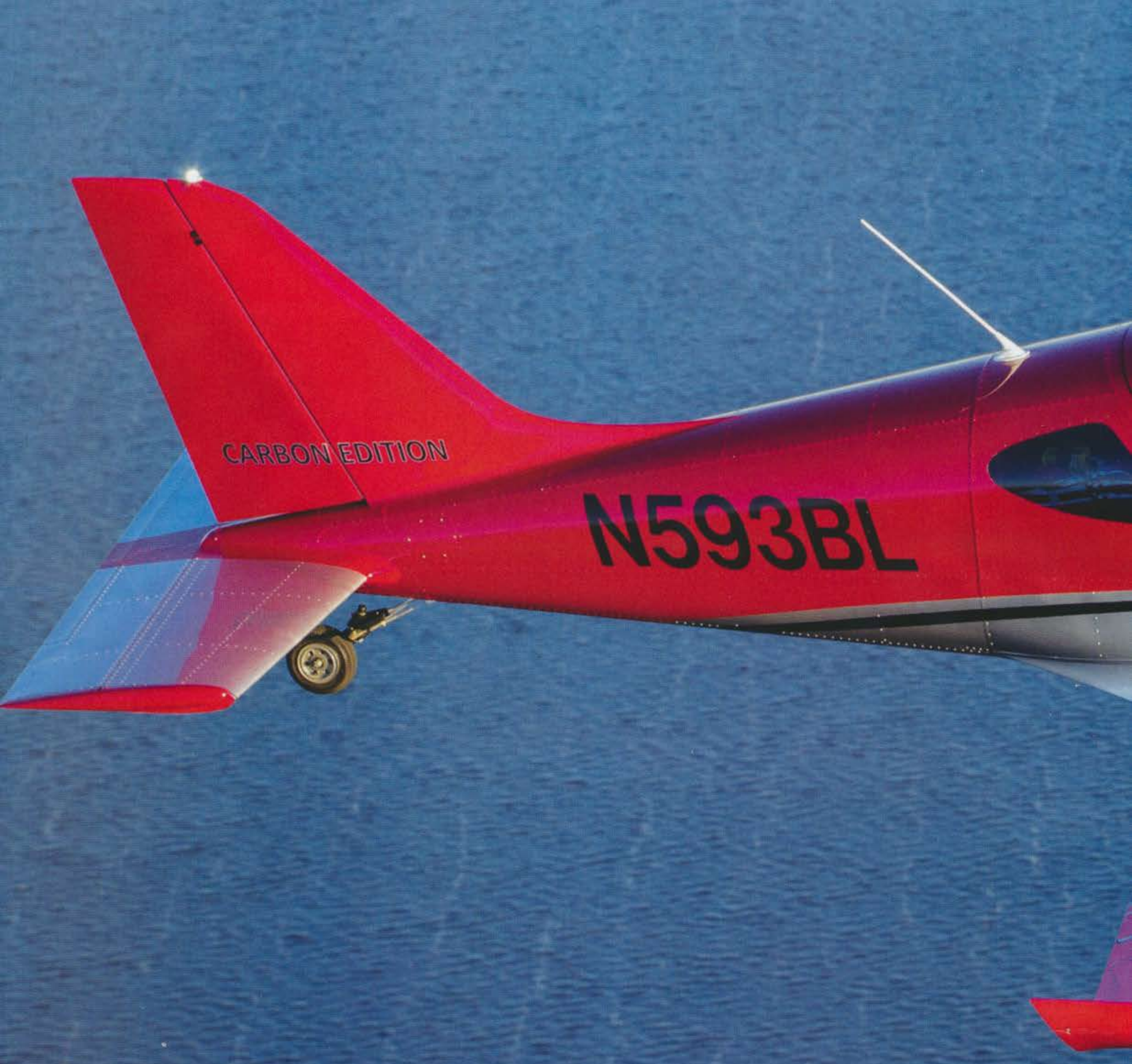
discarded. I'm always up for flying as comprehensive a test as possible, but landing a taildragger with a castoring tailwheel on a tarmac runway with a quartering tailwind is just asking for trouble.

Another facet of the Bristell that I like is that at 75kt the Vfe is usefully high, allowing you to keep the speed up in the circuit, while still being able to use full flap when you need it to slow down. This is a useful attribute when operating in a busy GA airfield. In fact, with its good turn of speed, fine field of view and powerful avionics the Bristell is equally at home at a small dirt strip as it is at a busy municipal airport. You can keep your speed up when needed, and land short if you have to. Fly the PAPIs if you feel like it (I never do) or try a glide approach and finish with a steep side-slip: it's all great fun. The aircraft is nicely speed-stable and has powerful flaps, while pitch trim changes caused by changing either the power or flap settings are negligible and easily trimmed out.

Starting off on R28 (as this puts the crosswind on the more favourable side) I fly a series of full-stop landings, as it is when the speed bleeds away and you lose rudder authority that things can get interesting. These go well – and so do the takeoffs, so I move onto 05. On takeoff the Bristell now demonstrates a distinct propensity to swing to port, as a combination of torque, P-factor and the crosswind does its best to spoil my day. Lots of rudder and deft dabs of right brake keep it moving in the right direction, but although things never get out of hand (or should that be foot?) I am very aware that at any moment they might. I really think that Bristell should seriously look at tailwheel steering, or at the very least some sort of tailwheel lock. If a steering mechanism linked to the rudder is too

***The Bristell is equally at home at a small dirt strip as a busy municipal airport***




***Fast, frugal and comfortable... it ticks just about every box for me***

heavy, then even a simple, cable-actuated locking pin would do it – although an electro-magnetic friction damper might be the most elegant solution.

I could cheerfully keep bashing the circuit for another hour, but John has prospects waiting at Sebring, so I reluctantly take us back to an agreeably smooth landing straight into wind. Whether it's because we are straight into wind and I've got complacent, or it's just 'one of those things' that makes dragging your tail so challenging I don't know, but as we slow the aft end just gives a little shimmy, as if to say "don't forget there's a castoring tailwheel back here!"

Conclusions? Well, I obviously loved it. Fast, frugal and comfortable, with great looks and fine handling, it ticks just about every box for me. There's an optional glider tow hook, and even my regular gripe about having a DV panel has been addressed. It's another option, as are Tundra tyres, wingroot lockers,

the fuel-injected 912iS engine or the 115hp 914 turbo. I'd definitely have the wingroot lockers: as they're located on the centre of pressure, they can carry up to 20kg each without affecting the C of G at all which, along with the standard bay behind the seats, means up to 55kg of baggage can be carried – and that's a lot!

In the States it's available as both a factory-built, ready-to-fly S-LSA and an E-LSA kitplane. In Europe it's sold as a VLA while in the UK it's available as a LAA Permit quick-build kit with the options of inflight adjustable propeller, the 120hp Jabiru 3300 engine and any panel layout you want.

When I tested the Bristell Fastback in 2012, I wrote that 'there had to be something about it that wasn't right'. Well, with the exception of a few minor aberrations I never did find anything wrong with it – and now, by simply moving the third wheel to the back, BRM have made a great aircraft even better. ■