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Shark, Shark!

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Shark!

Shark!

So efficient and long-legged, Zara Rutherford and then her brother Mack chose it for round-the-world flights. The Shark has performance to match its looks – but is not flawless

Words: Dave Unwin **Photos:** Keith Wilson

Our formation is tight and tidy, and I'm tucked nicely in echelon port when a USAF F-15 flashes past, less than a mile away. I've barely registered this when it suddenly occurs to me that fighters generally travel in pairs – and the number two roars past, significantly closer. Of course, they'd been aware of our presence all along. We're right on the edge of the Wash's danger area and camera ship pilot Steve has been in constant contact with the range controller, but the appearance of the Eagles is quite apposite.

It was just a shame they weren't F-16 Vipers, because we'd have had quite a lot in common. Just like a Viper pilot, I was sitting in a comfortable, semi-reclined seat under a big bubble canopy, with the throttle in my left hand and a stubby sidestick studded with switches and buttons in my right. The hi-tech panel displays a wealth of precise digital information with even more available at the touch of a button. But I wasn't flying a fighter, I was flying a microlight!

"You never get a second chance to make a first impression" is a wise old saw, and I must say that my initial impressions of the Shark were all very positive. Some aircraft look like they're moving even when they're standing still, and the Shark definitely falls into this category. Simply sitting on Fenland's rather damp grass on a cool

February morning the aircraft looked great – even its registration is perfect. From the point of the sharp-looking spinner to the tip of the swept-back fin it's easily the sexiest-looking microlight I'd ever seen. Indeed, my first thought was that it looked rather like a scaled-down Pilatus PC-21 turboprop trainer.

CORRECTLY BALLASTED?

Walking around the aircraft, I note that the 100hp Rotax 912ULS is very tightly cowled, and that access to the engine bay is adequate, but not outstanding, as quite a lot of Camloc fasteners need to be undone to remove the entire cowling for a full engine inspection. There's a large electrically adjustable NACA scoop in the bottom half, which supplies air to the oil cooler and radiator, and small intakes in the top half on both sides of the spinner for cooling the cylinders. Hot air from the engine bay is exhausted through appropriately shark-like gills in the sides. The oil dipstick is accessed through a small door in the top cowling, and there's another small door for ballast. Maintaining the C of G is always more critical in aircraft with tandem seating, and the Shark addresses this with a six kilogram moveable weight. When flown solo it goes in a special slot in the baggage bay – flown dual it must be in the engine compartment. Despite the fact that it must always be carried, it is not included in the basic empty weight, which I thought was a trifle disingenuous. The motor is fed from two wing tanks with a combined capacity of 150 litres (100 is standard), and spins a two-blade constant speed Woodcomp propeller – which, despite the name is made from carbon fibre.

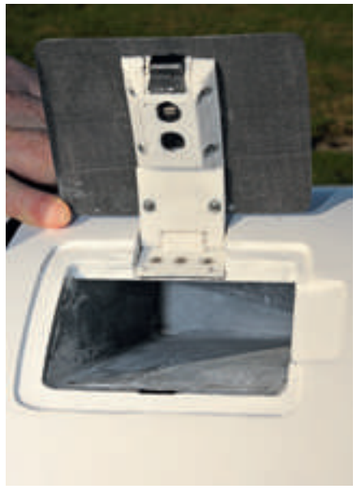
The electrically-actuated retractable tricycle undercarriage has a long wheelbase and a reasonably wide track. The nosewheel retracts aft, while the main legs are of a trailing-link design that retracts inwards, fitted with Beringer wheels and hydraulic disc brakes. The wings and fuselage are constructed of carbon fibre with a honeycomb core, the cockpit 'safety cell' is manufactured from a blend of carbon fibre and Kevlar aramid, as used in F1 cars. A unique carbon fibre process is used in the manufacture of the main spar. A significant advantage of using composite is that it enables the designer to create a very light yet stiff structure featuring a smooth, low drag shape with aerodynamically efficient compound-curve surfaces, and the Shark's designers have made full use of this throughout the entire airframe. The wing uses a sophisticated laminar flow aerofoil, and interestingly the ailerons extend right out to the tips and feature servo-tabs. There are stall strips close to the wing roots. The Shark is obviously a slippery beast, so I wasn't surprised to see the electrically actuated Fowler flaps have four settings: Up, 20, 30 and 38°. LED strobe and position lights are built into the wingtips and rudder, GoPro mounts are incorporated in the wing tips and tailplane *(acknowledgement that we are in the age of video posting – Ed)*.

The tail consists of a swept fin which carries a horn-balanced rudder fitted with a ground-adjustable trim tab, and a tailplane with a mildly swept leading edge fitted with a two-piece elevator. The primary controls are actuated by pushrods except for the rudder, which uses cables. Pitch trim is provided by an electrically actuated tab in the left elevator, and with the exception of the rudder, the control surfaces are gap-sealed. Overall, it is extremely well made and finished to an extraordinarily high standard.

AS FAST AS IT LOOKS

By now I was itching to find out if the Shark was as fast as it looked – it was clearly time to go flying! Access to the tandem cockpit is good. There is a decent-sized non-slip walkway in the left wingroot, while the big bubble canopy is hinged at the right side, again reminding me of the PC-21.

I took the front seat, and while TLAC Chief Test Pilot Howard Barber was strapping in acquainted myself with the cockpit. As mentioned earlier the bubble canopy does convey that mini-fighter feel, and this is enhanced once you're in the cockpit. Both the seat and pedals adjust – an unusual feature for a microlight, but as I was rapidly beginning



With someone in the back seat, the supplied 6kg weight must be lodged in the cowl ballast box...

... while solo flight requires it to be moved to a dedicated pocket in the baggage bay

Unusual refinements include the aerodynamic tweak of gap seals on all surfaces and a split elevator

Adjustable cooling intake: forget the usual trial-and-error blanking plates!

Individual pushrods operate the separate elevator halves

Ailerons are made all the lighter by servo tabs

SHARK 600

Price as tested €241,000 + VAT
Base price €200,000 + VAT

Dimensions

Length	6.85m
Height	2.50m
Wingspan	7.90m
Wing area	9.50sq m

Weights and loadings

Empty weight	361kg
MAUW	600kg
Useful load	239kg
Wing loading	63.2kg/sq m (13.1 lb/sq ft)
Power loading	8.04kg/kW (13.2 lb/hp)
Fuel capacity	100 lit (150 lit is an option)
Baggage capacity	25kg (15kg solo)

Performance

Vne	177kt
Cruise (TAS)	150kt
Stall	43kt
Climb rate	1,200fpm
Takeoff over 50ft	320m
Land over 50ft	330m

Engine
Rotax 912ULS liquid-cooled flat-four, producing 100hp (74.57kW) at 5,800rpm and driving a Woodcomp KW20W two-blade constant speed propeller

Manufacturer
Shark Aero Slovakia

UK Agent
The Light Aircraft Company Ltd, Little Snoring, Norfolk

Tandem reclined seats and sidesticks give the Shark a 'mini fighter' – or maybe contemporary sailplane – feel. Either way, it's just as beautifully finished

Well equipped panel is dominated by the Dynon combined primary flight/multi-function display. Reliable kit, we are sure – but it is good to have a back-up combination instrument in the form of the Flybox unit (not powered up here)

Lightweight composite used for nosewheel scissor link and fork

Compliant trailing link main U/C legs have rubber-block spring/dampers

to appreciate, this beast is a bit different to any other microlight of my experience. Even the seat adjustment is unique (at least to me). It's on a sort of hydraulic ram, so before getting in you press a button in the right side console and it rises up. Then you sit on it, press the button and it slowly sinks. When it's perfect for you release the button, then adjust the pedals. Very slick.

Throttle and prop levers are on the left, with the fuel valve on the left armrest behind the throttle. Rotary knobs ahead of the side stick control heating and ventilation, with car-type vents built into the cockpit sidewalls. Each occupant has a DV (direct vision) panel. Stowage is tight and the baggage bay is obviously inaccessible in flight, but there are small storage compartments below each armrest, a narrow glovebox below the instrument panel and a neat pen holder in the panel. A red T-handle fires the rocket for the Stratos Magnum parachute recovery system.

The PFD even features an angle of attack indicator

Overall, the snug cockpit is nicely laid out, and the controls are where you might reasonably expect to find them, as opposed to just being put where it's easiest. However, there's still room for improvement (see box).

Master 'On', I push in the myriad buttons (which also serve as circuit breakers), use the rotary knob in front of the throttle to pre-set the adjustable air scoop in line with the ambient temperature, press the starter button and the Rotax fires instantly. I do like Rotax's new Soft Start system – it's a lot less abrupt than earlier 912s. I also like the Dynon avionics, and note the PFD even features an angle of attack indicator, while an excellent feature is an optional wifi adaptor that allows supported devices to exchange data. For example, you can prepare a flight plan with a third party app, then download directly to the Dynon for quick and efficient preflight planning.

Following the Fenland Aero Club's 172 cameraship carrying Steve and photographer Keith to the active runway, I note that the undercarriage confers a very comfortable ride, and the field of view is excellent. The nosewheel steers through the rudder pedals, and the turn radius can be tightened by differential braking, an option many microlights don't offer, being fitted with hand-operated brakes. The powerful, progressive Beringer hydraulic disc brakes work well.

At the run-up point I run through the pre-take checks and as always note the local atmospheric conditions and our all-up weight. Runway 26 featured a gentle headwind of about 8kt from 250°, while the ambient conditions were below ISA, with a surface temperature of 6°C, a atmospheric pressure of 1013.4 and a field elevation of 8ft. With two POB, 54 litres/38kg of fuel and no baggage, I reckon we were about 50kg below the 600kg MAUW.

Rolling out onto the runway behind the 172, Howard reminds me not to over-rotate as it's all too easy to touch the tail bumper. As I always do on the first flight on type, I open the throttle slowly. Directional control is fine, acceleration adequate. Following Howard's advice, as soon as I feel the elevator start to bite I hold the nosewheel just off the ground and the Shark soon slips into the sky having used about half of the 670m runway. The ground roll feels

Takeoff shot shows the relatively large flaps and limited clearance between ventral fin and runway

The Shark's stability must come in part from its relatively large tailplane

Undercarriage operation is confined to a narrow speed range. It's consequently of no use as a speed brake

slightly untidy, as the nose pitched and bucked a bit – I suspect it's a lot easier on Tarmac. Now I encounter the Shark's oddest facet. For reasons best known to the designers, the undercarriage uses airspeed to inhibit retraction, not 'weight on wheels' microswitches. There's a switch in the pitot-static system which prevents the wheels from retracting below 60kt IAS, or above 76, irrespective of the undercarriage selector's position. Having to maintain a sixteen-knot speed range simply to retract the undercarriage demands accurate speed control, and this is not helped by the low flap limiting speeds. This is unsatisfactory, and is a solution searching for a problem, although once the undercarriage is extended the limiting speed is a heady 124kt.

I haven't flown with a sidestick for years, but before I'm tucked into echelon port I don't even notice it. With 'plenty of overtake', a fabulous field of view and crisp controls formation flying is easy and the air-to-air shoot is great fun except for – you guessed it – shooting the undercarriage retraction sequence.

A REAL THOROUGHBRED

As soon as we are well clear of the cameraship I begin to examine the general handling characteristics. I am already beginning to feel very comfortable with the Shark, and even a cursory examination of the stability and control (or as I prefer – control and stability) reveals that this machine is a real thoroughbred. The ailerons are light and powerful, the elevator authoritative and the rudder nicely balanced. Control harmony is also ideal, with the ailerons being the lightest primary control and the rudder the heaviest. Furthermore, all the primary controls are well weighted, with low breakout forces and very little 'stiction', even though the airframe only had 31 hours on it. The electric pitch trim is nicely geared and I don't miss being able to adjust either the rudder or aileron trim.

A more vigorous exploration of the flight envelope soon shows that it has a commendably rapid roll-rate for a microlight, and I note that only small amounts of rudder are necessary to keep the slip-ball centred. It really is a shame that – being a microlight – aerobatics are forbidden. The Shark is also very stable and – for what is a relatively light aircraft, feels like a heavier machine. In fact, when I try some 60° banked turns it almost feels like it's on rails. All you have to do is put the nose just above the horizon, roll on loads of bank and then reef it around. When manoeuvring aggressively I am extremely grateful for the excellent field of view conferred by that giant canopy. It really is outstanding – only modern sailplanes and fighters come close.

Thinking about gliders, I pull the power to idle and examine the glide angle – at 70kt it is quite flat, with a relatively nose-up attitude and a sink rate of only around 300fpm. A look at the stick-free stability reveals it to be positive longitudinally and directionally. Having trimmed for 100kt I ease back on the stick until the speed drops to ninety and then release it. After only two long wavelength, low amplitude phugoids it returns to the trimmed speed. It is nicely damped in pitch, and also in yaw. Spiral stability is essentially neutral, being neutral to the left and just faintly positive to the right (because of the propeller effect). Time for some slow flight and stalls, and the only problem is that – as it is quite slippery it's reluctant to decelerate – a problem exacerbated by the low flap and undercarriage limiting speeds. Vfe is 76kt, but the flap control system also has a switch in the pitot-static system, this one prevents the flaps being lowered above 70kt.

In complete contrast to both the Shark's appearance and its name, it doesn't bite and slow flight is very benign; although a downside is that the pre-stall buffet is very subtle. Flaps up, it stalls at 41kt IAS and breaks to the right. With full flap it is an impressively slow 35kt, and this time breaks left. However, I suspect significant position error here, as the POH gives a Vs of 47kt and a Vso of 40 at MAUW. Recovery is very easy, with minimal loss of altitude.

Shark Suggestions

By now, you've probably worked out that I really like the Shark. In fact, I really, really like the Shark and this whole feature could have just been full of superlatives and glowing praise, but I wouldn't be doing my job if I hadn't found something I didn't like! Furthermore, it's obvious that the Shark's market is the frustrated fighter pilot that lurks within many of us, so why not make it even more fighter-like? Firstly, I'd suggest making the parachute recovery system's handle a black and yellow striped loop (like an ejection seat's), which would make the cockpit look even more like a fighter's. The sidestick could use one of those Infinity stick tops with all the buttons and possibly even on the throttle as well. The HOTAS (hands on throttle and stick) thing isn't pure aesthetics though. The low Vfe means that on a go-around you need to get the flaps moving almost as soon as the throttle hits the stop, so a pistol grip on the throttle could incorporate switches for the flaps, transponder ident and transceiver flip-flop to compliment the buttons on the sidestick for electric trim, push-to-talk and autopilot disconnect.

The prop lever should be blue, and the undercarriage selector needs more presence. It's operated by a small toggle switch which is essentially the same as the intercom selector but is sprung to neutral, which means that its position provides no clue as to what's supposed to be happening. It needs a wheel-topped lever that is either 'Up' or 'Down' (much more tactile). In fact, I'd put it in front of the throttle where the intercom switch is, and swap the combined undercarriage and flap annunciator panel with the radio. The undercarriage and flap annunciator lights also need work. With all three wheels locked down, 'three greens' is traditional. Wheels out of the wells and unlocked, red is the accepted convention. 'Up and locked' – lights out. The Shark has three green and three red lights, and when I flew it the red lights flashed when the undercarriage was unlocked, but also flashed if the airspeed dipped below 100kt when the wheels were locked up, and stayed on red when the wheels were up. This has been improved since my flight test. Upon retraction the red lights now go out after five seconds, and the green lights flash and a horn sounds if the airspeed reduces below 67kt with the wheels up. This is an improvement, but it would be better if the red lights flashed in these circumstances.

The flaps are currently selected by pressing the appropriate yellow button, which flashes until it reaches the selected setting, then stays on. However, if it senses you're approaching Vfe (and that's very easy to do) it also flashes, which is confusing.

Finally, there's a pair of green LEDs that indicate the position of the moveable ballast, and one of these also remains illuminated in flight. It would be better if the ballast system was arranged so if there is a mis-match between the number of occupants and the ballast's location, the engine simply won't crank. Four microswitches, some wire and a solenoid is all you need. The green LED which shows the weight's position doesn't need to be on once the engine has started, and could even be deleted. There are already too many lights on when everything is normal. With the exception of the undercarriage being locked down, I don't need to know when things are OK – just tell me when they're not. I like a dark, quiet cockpit.

Amongst other improvements, the throttle lever (black grip) and sidestick could be made HOTAS controls, suggests Dave

Crossing the controls for a head-on shot reveals the Shark's slender profile

Accelerating out of the final stall, I set 5,000rpm and 26ins MP (76% power), trim forward and let the Shark accelerate. This is 'fast cruise' and the indicated airspeed soon stabilises at 140kt, which is very impressive on only 100hp. At this power setting at 5,000ft it will true out at an impressive 150kt for a fuel flow of around 20 litres per hour. Although blisteringly fast by microlight standards, it's also quite thirsty, and a more representative power setting of 43/24 (economy cruise, 55%) still gives a TAS of 140 at 5,000ft, but at a much better 15 lph. If you've chosen the 150 litre tank option, the range at economy cruise is over 1,300nm plus thirty minutes VFR reserve. Even the smaller tanks give a range of 750nm plus VFR reserve.

FLAP & U/C LIMITATIONS

By now I was eager to assess the Shark in the circuit, and push the power back up. It didn't take long to 'RTB'. As mentioned earlier, it is very clean aerodynamically, and as the flap and undercarriage limiting speeds are a bit too low it's not easy to slow down. If you're in close to the airfield and hot 'n' high it may embarrass you. Essentially, you cannot go down and slow down, it is one or the other! On the other hand, a run & break seems an entirely apposite way to enter the circuit – so that is what I did (and I never thought I'd write that sentence in a microlight flight test!) In all seriousness though, pilots who have trained on draggier aircraft must learn to monitor the Shark's energy level (speed and height) very carefully, particularly as you can't use the undercarriage or flaps to slow down.

Once correctly configured it's quite speed stable, and lowering full flap pitches the nose down slightly but the pitch-trim loads don't change as the elevator pushrod in the baggage compartment is connected by cables and springs to the flap control system and adjusts automatically, making trim changes minimal. However, it is still very important to watch the attitude and airspeed – as even lowering the nose by a couple of degrees produces an increase in speed. During the briefing Howard had said "don't hold off fully, just arrest the sink rate over numbers, hold the nose up slightly and wait. And don't over-rotate." I can feel Howard guarding the stick as he said he would, and yes – I did try to 'sweeten' the touchdown and almost scraped the tail! The go part of the touch 'n' go is great – just watch those speeds (it took me two attempts to get the undercarriage up). My second landing is 'firm but fair'. Howard approves (as an ex-747 pilot he likes landings to be in the touchdown zone) but it is a bit abrupt by my standards, so (with Howard's approval) on my next approach I leave the flaps at '2'. This gives me a slightly protracted float, and as I now have the correct pitch picture for the flare in my mind the touchdown is gratifyingly smooth. We still make the intersection turn off without needing to brake.

At 76% power at 5,000ft it will true out at an impressive 150 knots

AND THE VERDICT?

Obviously, I loved it – the ergonomics need work, but the fine handling and sexy looks are undeniable – as is the excellent performance. In summary, the Shark can clear a 50ft obstacle in less than 350m, cruise at 150kt TAS, or cover over 1,300nm while only burning 3.7 litres every forty nautical air miles, then land over a 50ft obstacle in 330m. I've flown quite a few aircraft that meet some of those parameters, but nothing else that meets all of them.