Our new full-fat flexible friend

The 500kg DeltaJet 500 StingRay is absolutely superb, says **Steve Uzochukwu**

FOR the past two years, the two-seater flexwing market has been in the doldrums.

The UK's last manufacturer of factory-built two-seaters folded two years ago this May, and has only just resurfaced.

There have been some exciting SSDRs, and the sub-70 market has taken off, but the two-seater market has sat dormant.

Then a year ago, rumours started circulating of a brand new factory-built two-seater coming to the UK. BMAA Tech Office involvement is a requirement, but it couldn't comment.

The message got passed on, and in late June we were told by John Waite about Exodus Aircraft and the DeltaJet 500 StingRay.

The company and the people

Exodus Aircraft, put together by Rob Grimwood and John Waite, is part of the Exodus group, with sister company Exodus Airsports providing training on flex or fixed-wing microlights.

John learnt to fly with Rob a while back, then teamed up with him to tour and compete, and their subsequent CV is impressive: European flexwing, then European and World fixed-wing champions in the Nynja they built, with two more built since.

Rob was the UK microlight champion for nine consecutive years ending in 2014. He's also the only pilot to have concurrently held World, European and National championships in an individual class.

The background

Spurred into action by the closure of P&M in 2019, and with the experience above, the pair decided to base their flexwing on the Delta Jet 2, made by Apollo in Hungary. The Delta Jet 1 has consistently performed well in competition, and is the forerunner of the Revo in the USA that UK pilots have looked at enviously.

The StingRay wing is a 12.8m² topless offering from Aeros, with an Xlam upper surface and Dacron lower. It was chosen for its excellent flying attributes and capability at 500kg MTOW.

Xlam has a very good track record for dimensional stability and UV resistance, and Aeros has an excellent reputation for flex and rigid-wing hang glider construction, with multiple world hang gliding championship wins. It's also the wing builder for Flylight trikes.

The DeltaJet 500 StingRay has just completed extensive development and testing for *CAP482/BCAR Section S* certification.

It will be the UK's first flexwing microlight in the 600kg category, with a maximum takeoff weight of 500kg. With an empty weight of 250kg, there's a 250kg payload and a generous 120kg individual seat limit load.

An alternative carbon-fibre-based body with new construction techniques could get the empty weight down to 240kg or less. The aircraft will be built under Flylight's factory build approval from the CAA. ▷

The trike

The trike has a fibreglass body enclosing the frame. It has a full-length aluminium keel carrying a steel engine frame, aluminium pylon and seat frame, with a set of steel forks and a mount for the front strut. The fuel tank straddles the trike keel underneath the passenger seat.

The rear undercarriage is a cantilevered aluminium beam, so there are no wishbones, drag links or supporting struts. The rear axle is covered by a fairing. The pylon and struts have internal cable backups.

The current engine is the 100hp Rotax 912S, and the trials were completed with this engine variant. It's covered by an easy-to-remove fairing.

The oil tank is accessible for the daily inspection, and the newer inspection window on the coolant expansion tank allows the coolant level to be verified visually without cap removal. There is a slight offset on the thrust axis to counteract for torque reaction, but it's impossible to see.

An 80hp 912 is a natural option, and a 115hp BMW-engined version will start test flying soon. I'll report on that as soon as I get to fly it.

The propeller is a Kiev prop, with no need for prop tape.

The air scoops to the rear of the body feed oil and water radiators. A high air flow ensures effective cooling. With storage inside the body, external panniers aren't needed. The bottom of the fairing under the radiators protects the prop blades at the lowest part of their sweep from debris thrown up while on the ground.

The main fibreglass body is secured to the seat frame, but with a number of panels that can quickly be removed for inspection, and access to generous underseat storage.

All fasteners are large flat-head Allen bolts. Seat cushions are firmly held in place with strong hook and loop fasteners.

Under the front lip of the pilot seat there is an area outboard on both sides with dedicated footrests for the passenger. On production models this is where the adjustable rear-seat steering will be placed.

This rear-seat steering will not double as a footrest for passengers. In front of this, between the passenger footrest area and the base of the cockpit, two pockets exist for fast stowage of smaller items, and they might even take a small but tightly packed tent.

There's also room for a pod bag, which is a listed accessory.

The footwell contains an extremely well sealed front-wheel cavity, and pilot footrests that are quickly adjusted with the removal and replacement of two pip pins. The brake pedal is on the left-hand footrest, and the throttle on the right one, as normal. The fuse box is easy to access behind the lowest part of the instrument panel, both for fuse replacement and additional wiring.

The brake pedal connects to a choice of one, two or three calipers. You can brake the front wheel alone, the two back wheels or all three. The wheels have 8in tyres in a size commonly used for both microlights and scooters, which allows for good tyre choice and the knowledge that high-speed use on tarmac is part of the design brief.

The instrument panel is populated by Kanardia Indu 80mm gauges for the three main displays (ASI, VSI and altimeter) with the extra functionality over traditional technology gauges.

This range of gauges is actually digital, but with analogue main displays and secondary numerical indicators within the circular main function.

An example would be the flight time within the altimeter, or a numerical display of flight level in the same area of the gauge, so there is no need to readjust your altimeter away from QNH or QFE to see flight levels.

The rev counter is an Indu 57mm gauge, and the three engine functions (oil pressure, oil temperature and cylinder head temperature) are all traditional analogue gauges, as is the fuel gauge.

There's also a fuel level sight for use on the ground to check gauge functionality – it's up the side of the fuel tank, and a small button switch in the left-hand recess switches on an LED lighting strip that allows you to see the fuel level on the ground, through the hole in the fibreglass body where the left-hand half of the of the pilot lap belt comes though.

Mag switches are single up/down items on the dash, but will be in recesses on production models, along with trim switch, hand throttle, choke and check light for fuel level.

Carb heat is a switch on an electrically controlled valve to turn the carb heat on/off. This interrupts the flow of warm coolant through Skydrive-style Mark 2 carb heaters, which are fitted up against the main carburettor bodies to prevent carb icing.

On this first aircraft, the area to the right-hand side of the dashboard is taken up with a portable radio, but it is also laid out so a panel-mount radio and a transponder could fit there.

There's a tall screen that deflects the wind off you, but still allows that "out in the breeze" feeling. The pilot and passenger can have lap belts with a diagonal shoulder belt each, or the rear passenger can have two shoulder straps down to the lap belt, and the pilot fly with just the lap belt.

I flew with the footrests set to the middle position, and with one diagonal shoulder belt. The shoulder belts are on inertia reels, so they don't constrain movement in normal flight, but, as you'd expect, they'll lock up in the case of sudden deceleration. ▷

> "A tall screen deflects the wind off you, but still allows that "out in the breeze" feeling

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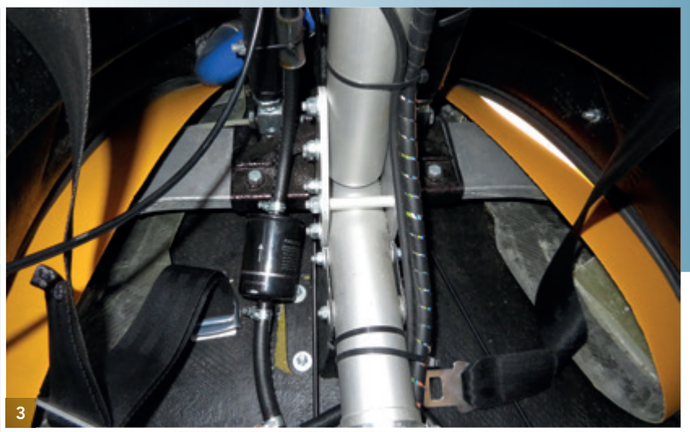
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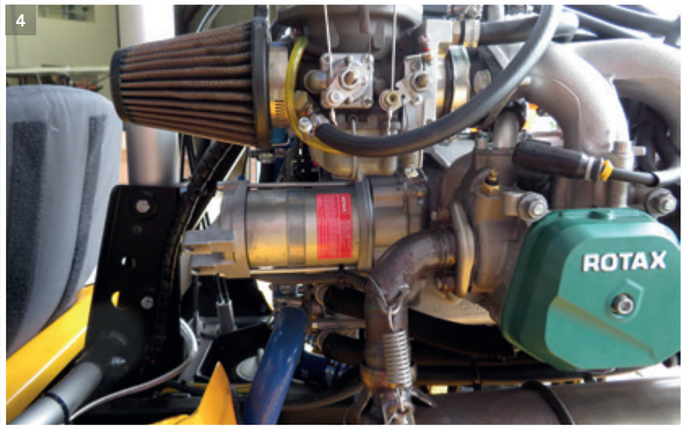

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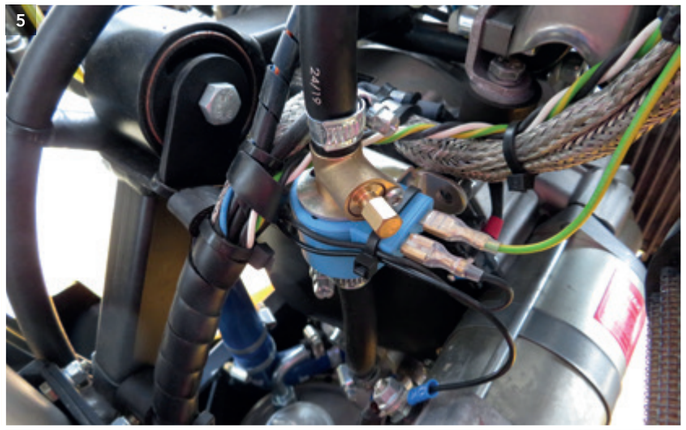
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Photos

1 Rear cowling in place
2 Rear view shows the neat engine installation
3 Beam axle in 100mm-wide aluminium
4 Cowling removed to show the high-power starter
5 Electrically controlled carb heat on-off
6 Instrument panel. Four Kanardia instruments in the top row, and traditional fuel gauge and engine instruments


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6

Rob Grimwood (193cm) flying and Steve Uzochukwu (185cm) in the back. There's plenty of room in there… (photo: Paul Dewhurst)

> A top-end machine, and it only needs average flexwing skills to fly it well

The wing

The StingRay is a 12.8m² topless wing with struts. Sailcloth on the top surface is Xlam, the lower surface is Dacron.

The wing has two washout rods (or sprogs) and they maintain the washout at two-thirds span and the wingtip. There are winglets for directional stability, and 30 battens (22 top, eight bottom) in total, including spanwise ones to distribute the pressure from the washout rods.

Conventional batten ends are secured by cord on the inboard battens, and bungee outboard. This helps handling, as those of us who have flown hang gliders with the batten bungees too tight will testify.

Sail tension is low, and the pullback can be attached by hand without the need for pulleys or tensioning devices.

The wing trim works on a moveable hang point over an 80mm range. The pylon hinges above the seat assembly, removing the need for a channel in the main body for the lower pylon to hinge into. This frees the area directly below the passenger seat for a ballistic reserve, if one is specified.

Flying

My first trip in the StingRay was in the passenger seat for aerial photos, with Rob demonstrating the aircraft and skills required for air-to-air close up photography, while Paul Dewhurst in a Skyranger provided the camera platform.

The passenger seat is very comfortable, and the tall screen deflects the main force of the wind, so despite sitting higher than the pilot for excellent forward views, you are not buffeted about at higher speeds. There's a large area for your feet to sit in, with no draughts to make your feet cold.

My next trip was as the pilot. I'm 185cm tall, and when I was in the front seat with 193cm-tall Rob Grimwood in the back, we were very well catered for spacewise.

On the ground, the StingRay feels very well planted and stable, and as you leave tarmac for the slightly bumpy grass on the way to the runway, it seems to soak up the bumps via the front shocks and rear beam axle. It's light enough in pitch that holding the wing neutral requires no effort.

After rotation, the trike picks up both speed and climb rate very quickly, and settles down into a rapid climb at roughly 63mph with the trim set to the midpoint.

When I say "rapid climb", it wasn't possible to get a 60s climb figure, but at the trimmed position we maintained 1250ft/min with blips up to 1650ft/min, admittedly in the presence of some thermal activity.

The propeller is pitched for a maximum 4950rpm on the takeoff run, which just about touches 5000rpm in the climb. Backing off to 4500rpm still gives a respectable 600ft/min at the same climb speed.

The speed range is large and effective, as it directly moves the centre of gravity of the whole aircraft. Slow trim is close to 50mph, with the engine turning over at roughly 3400rpm, and although the bar is some way forward, roll pressures remain light, and you're in a position where you could fly in convoy with much slower microlights.

Minimum sink and best glide are at this speed, and with 500ft/min sink rate at just over 50mph, we got about 8.5:1 glide. Trim position is intuitive: you speed up or slow down, then adjust engine rpm for level flight. Trim position can be checked by looking up at the keel if needed, as both extremes of the travel are clearly marked.

Instruction can be carried out at a sedate 65mph, and there's a sweet spot for cruising at about 75mph, with the engine turning over at just under 4000rpm.

With the trim set fastest, you can get to about 87mph before the aircraft starts to climb when the power is increased further, so this is the top end of the trim with no pilot input.

I was able to get about 108mph in straight and level with the bar pulled in. The maximum speed the aircraft has been demonstrated flying at is 130mph, so for *Section S* the V_{ne} will be 90% of this, at 117mph.

Of course, trikes are about handling, so it was time to put the StingRay through some turns. At cruise speed the machine flicks quickly into steep banked turns of up to 60°, and the roll reversal 45° to 45° is swift.

In 45° banked turns, despite the responsiveness of the wing into the turn, the control bar can be released in the stable turn and you remain there. The same is true of straight and level flight.

In steeper turns you need more pitch and some throttle, as with most flexwings, and turn behaviour is excellent at all the bank settings tried up to 60°. Control force builds up linearly with deflection, which means you have a very good idea of how rapid the response is when you make the input.

The stall is very benign, but it does stall with the bar against the front strut after a little bit of wallowing with low level buffet. Sometimes there is a very small amount of wing drop.

After each stall, I allowed the bar to move back slightly so the aircraft picked up speed. This is the sort of stall behaviour that's good for teaching, as it won't bite at a sensible altitude.

I did two landings on the StingRay. Having only had some basic flexwing flying two days previously to have some level of currency, I didn't consider myself to be razor-sharp, just merely competent, but the landing behaviour of this aircraft is very flattering. It seems the rear axle, the height difference between the front and rear wheels in flight and excellent handling makes for a smooth landing.

I had also thought the conditions we'd flown in were relatively benign, until just after this flight I took an SSDR up with less than half the wing loading, and found thermals aplenty and strong conditions, so the StingRay seems to be very good at cutting through the rough stuff.

Conclusion

We're emerging from a dreary period in two-seater flexwing flying, but we now have two factory builders, and the DeltaJet 500 StingRay is a very worthy representative for one of those brands.

Superb comfort, speed, handling and a very keen price make for a package that's going to be hard to beat. It's not going to have the badge of the fastest, but it makes up for that in the huge range of speeds it can comfortably fly at, and its multifaceted nature in that it could be a touring, instructional or competition machine with no changes to its configuration.

That observation raises for me the elephant in the room: the pilot skills demanded by top-end machines. To be current to fly this review, I had some time in a Quantum Leap days before these flights, and the same level of skill is required to fly the StingRay. It makes no more demands on my piloting skills than the Quantum, which was for many years the staple of the instruction fleet in the UK.

It's a top-end machine, but it only needs average flexwing skills to fly it well.

Absolutely superb. □

TECHNICAL DATA

Exodus Aircraft DeltaJet 500 StingRay

MANUFACTURER

Exodus Aircraft, Plaistows airfield, Chiswell Green, Hertfordshire AL2 3NT; exodusairsports.co.uk. Directors: Rob Grimwood 07786 034439, John Waite 07949 071149.

SUMMARY

Tandem two-seat flexwing aircraft with weightshift control. Rogallo wing with keel pocket and winglets. Pilot suspended below wing in trike unit, using bar to control pitch and roll/yaw by altering relative positions of trike unit and wing. Wing braced from below by struts; floating cross-tube construction with 86% double-surface Xlam covering; 22 battens on top surface, eight battens on undersurface. Electrically operated moveable hang-point trim system. Undercarriage has three wheels in tricycle formation; coil-spring suspension on nosewheel and aerodynamically enclosed one-piece beam suspension on mainwheels. Push-right go-left nosewheel steering independent from aerodynamic controls. Adjustable foot pedal positions. All-terrain wheels and tyres. Hydraulic disc brakes on nosewheel (optional mainwheels only, or all three wheels). Aluminium-alloy tube trike unit with GRP body (carbon-fibre optional). Engine mounted below wing, driving pusher propeller.

EXTERNAL DIMENSIONS AND AREAS

Length overall 3.30m. Height overall 2.75m. Wingspan 9.52m. Chord at root 2.12m. Chord at tip 0.38m. Nose angle 128°. Wing area 12.85m². Aspect ratio 7.05/1. Wheel track 1.66m. Wheelbase 1.75m. Wheels 42cm dia overall. Turning circle 8.0m.

POWERPLANT

Rotax 912ULS liquid-cooled engine. Max power 100hp at 5800rpm. Kiev 283/1800 propeller. Gearbox reduction, ratio 2.43:1. Power per unit area 7.78hp/m². Fuel capacity 55 litre.

WEIGHTS AND LOADINGS

Empty weight 252kg. Max takeoff weight 500kg. Payload 248 kg. Min pilot weight 55kg. Max seat weight 120kg. Max wing loading 38.9kg/m². Max power loading 5.0kg/hp. Load factors +4 -0g recommended, +6 -3g ultimate.

PERFORMANCE*

Max level speed 112mph. Never exceed speed 117mph. Cruising speed 80mph. Stall speed 43mph (39mph CAS). Hands-off trim range 49-87mph. Max climb rate at sea level 1050ft/min. Min sink rate 500ft/min at 48mph. Best glide ratio with power off 8.02/1 at 60mph. Takeoff distance to clear 15m obstacle 242m on wet grass. Landing distance to clear 15m obstacle 219m on wet grass. Service ceiling n/a. Range at average cruising speed 320 miles.

**Under the following test conditions:*
Sywell aerodrome altitude 500ft. Ground temperature 8°C. Ground pressure 1012mB. Ground windspeed nil. Flown at 468kg all-up within the current 472.5kg limit. Airspeeds are indicated airspeeds except where stated otherwise.

PRICE INCLUDING VAT

DeltaJet 500 StingRay 912ULS (100hp) £38,495.

Alternative powerplants:
DeltaJet 500 StingRay BMW (115hp fuel-injected) £35,495.
DeltaJet 500 StingRay 912UL (80hp) £36,495.

Data above provided by manufacturer prior to final certification
Data in flight-test text is tester's experience