The Titan jet engine is a standard commercial item which is used successfully in large R/C models. Although less than 40cm long and weighing just 3.7kg, it produces 390N.

A computer generated image of the completed GloW hybrid glider. It should be flying later this year.

PROJECT GloW

Will ProAirsport's innovative jet-powered SSDR self-launcher transform gliding… or microlighting… or both? Dave Unwin investigates.

I love soaring. The first time I ever flew and my first solo were both in gliders, and for me soaring flight exercises a fascination that is both difficult to explain and hard to resist. Often described as 'three-dimensional sailing', the ability to fly a heavier-than-air machine for several hours and hundreds of miles by using the atmosphere as the fuel and your intellect as the engine possesses an undeniable attraction.

Of course, two inevitable downsides of the pure sailplane are that assistance is required both to get the thing airborne and then again when you land out. Furthermore, we all know that gliding can be almost as frustrating as it is fun, thanks to aircraft serviceability, airspace and airworthiness issues, licensing and, of course, the capricious nature of the weather. However, what I find really frustrating is when everything else is beautifully aligned and the gliding club is closed or distant! Indeed, some of the subtlest soaring conditions are often found when the low light of early morning and late evening can be stunning. These are two of the reasons why, although I live only 20 minutes away from the gliding club, I keep a Jodel D9 on a farm strip only ten minutes from my house.

What I really need is a sailplane that I can rig by myself and then safely self-launch from a 500m grass strip. I've never really been a fan of the engine-on-a-stick configuration, while the jet-powered self-sustainers just don't have enough thrust to self-launch. In fact, I have no desire to go back to the performance offered by early motorgliders, which were desperately underpowered and possessed two distinctly unattractive traits – a marked reluctance to leave the ground and a disturbing eagerness to return to it! They just weren't very nice to fly.

Consequently, when I heard that ProAirsport was proposing a new type of self-launching SSDR sailplane powered by a lightweight turbojet, my initial reaction was one of scepticism. The history of flight is littered with the wrecks of ill-conceived aircraft; trying to squeeze 1,000kg of ingenuity and enthusiasm into 800kg of possibility almost always seems to end in tears. I doubted that this thing would have enough thrust to even taxi to the far hedge, let alone fly over it.

But then Roger Hurley, ProAirsport's CEO, revealed that Project GloW was a hybrid, and that the wheels would be driven by a powerful electric motor to assist the turbojet in accelerating the glider to take-off speed. Instantly my initial scepticism turned to enthusiasm and I made an appointment to meet Roger at the ProAirsport factory. Here I studied the blueprints and CGI, inspected the fuselage plug and marvelled at the compact nature of the jet engine.

I learned that the wings are 'standard' (with some aerodynamic tweaks) from an existing glider, which straightaway increased the project's credibility as, in my opinion at least, there's no point in constantly reinventing the wheel (or the wing in this case) and that choice just greatly reduces project risk and cost. Designed to meet the requirements of the new UK Single Seat Deregulated (SSDR) class and the US Light Sport category, GloW will have a MAUW of 300kg and an empty weight of about 180kg, leaving a payload of 120kg. If you fill the tank there's 93kg left for the pilot and parachute (unfortunately there simply isn't room for an inbuilt Ballistic Recovery System).

Both the methods and materials used in its construction are standard sailplane technology. The fuselage is essentially fibreglass with aramid and carbon fibre used only for local strength. The wing is foam core and fibreglass sandwich construction. Modern composites are fantastically strong and with the cockpit area also having local carbon/aramid reinforcement, I would expect it to be pretty crash worthy. The acrylic canopy, also standard, is forward-hinged and features a 'direct-vision' panel.

The fuselage carries the wing, engine, fuel tank, batteries and the clever powered undercarriage. The shoulder-mounted wing gently sweeps at the tips and uses a modified NN18-17 laminar flow aerofoil with only a small amount of dihedral. Large Schemp-Hirth type airbrakes are fitted to the top surface of the wing at about 45% of the chord. The location of the Titan jet engine is particularly interesting as it is fixed internally behind the cockpit and features an automatic open/close intake scoop.

> "The acceleration really should be outstanding, in fact wheel spin could be an issue if power is applied too quickly"

This very neat little turbojet is less than 40cm long and weighs an astonishing 3.7kg, yet produces a creditable 390N. This should be enough to produce reasonable climb rates at around 50kt, while the 34lt fuel tank should be good for several further climbs.

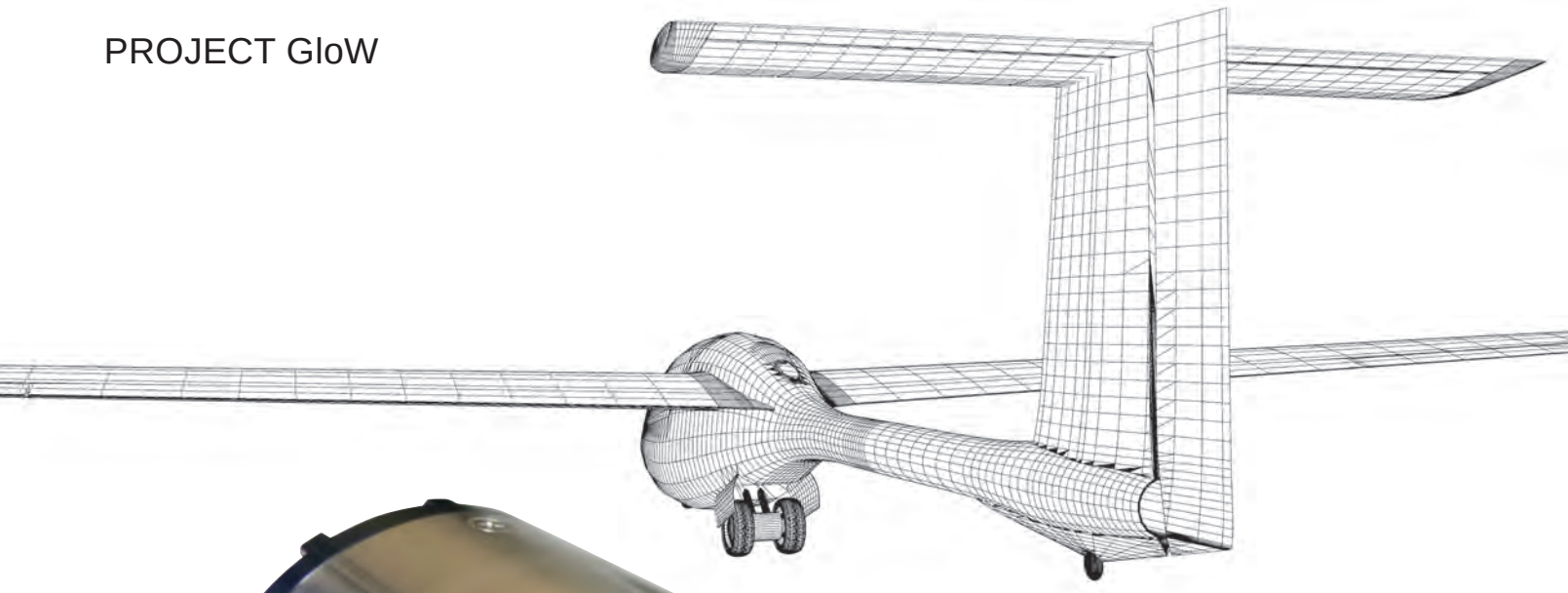
Fuel quantity may improve, but current thinking is that only having a single fuselage tank is much simpler, particularly when rigging and de-rigging. As the engine can burn a variety of fuels, from Jet A-1 and JP-4 to diesel, kerosene and domestic fuel oil, it cannot only be readily refuelled from a variety of sources but is incredibly cheap (domestic fuel oil is currently 50p a litre). It is expected that a take-off and climb to 3,000ft will burn about eight litres of fuel, so the cost of a relatively high 'go-where-you-want' launch will still be less than the average winch launch, and a lot less than the average aerotow. In the cruise, fuel flow is predicted to drop as low as half a litre a minute.

The Titan is a standard commercial item which is used successfully in large RC models and drones. All maintenance is 'on condition' and, compared to a piston engine, turbines do offer several advantages. They are light, compact and have few moving parts. Vibration levels are low and they are very reliable. They are also much easier to start - select start, the air scoop opens and the engine starts! Shutting it down is equally simple.

A significant advantage of mounting the engine inside the fuselage is that while it is spooling up (and starting to produce thrust) there's very little drag produced – unlike a large windmilling propeller mounted on top of a pylon.

GloW has been designed for easy rigging; a special trailer that allows solo rigging will be an option. With the complete empty weight being only around 180kg, rigging shouldn't be too taxing. Pushrods actuate the ailerons and elevator, cables the rudder.

Now we come to GloW's most unconventional aspect, the undercarriage. This consists of four wheels of three different sizes mounted along the fuselage centreline. There's a small steerable pneumatic nosewheel, a tiny solid urethane wheel at the back (more of a 'tail bumper' really) and dual retractable mainwheels driven by a powerful electric motor. Modern electric motors put out a lot of torque and this can produce incredible rates of acceleration, with Roger explaining that this high-tech, brushless motor is a standard commercial unit that has been specially customised for ProAirsport. The bespoke controller is supplied by the motor's manufacturer (to ensure compatibility), with the LiFePO4 battery pack and charging ›



An earlier 'wire' computer image shows the outlet for the jet thrust and the driven wheel arrangement

The hi-tech, brushless motor is also a standard commercial unit. With a peak output of 7kW and using clever gearing, it will quickly accelerate the glider to take-off speed.

system all use standard parts. Using the powerful electric motor to accelerate GloW up to take-off speed is the design's 'secret sauce' – and I am utterly convinced of its virtues.

For take-off, GloW can be wings-level taxied, even reversed into position, with the motor also acting in place of mechanical brakes (further advantages of electrically-driven wheels) before starting the jet and setting full power. With a peak output of 7kW and clever gearing, the wheels will easily and quickly accelerate the aircraft to the safe speed above which it will fly (the wing has a slightly negative angle of attack on the ground), then a smooth rotation will ease it into the air allowing it to climb away using the thrust of the jet. As the electric energy required for take-off is wanted for only a few seconds (the acceleration really should be outstanding, in fact wheel spin could be an issue if power is applied too quickly), then take-offs from farm strips should be possible.

The design certainly looks extremely professional (Roger has assembled an impressive team of pilots and engineers, including renowned aerodynamicist John Gibson, aero-engineer Vittorio Pajno and Finance Director Stephen Lynn) and emphasised that although the SSDR class is not regulated or subject to mandatory airworthiness approval, ProAirsport decided from the start that recognised standards would be adopted. Consequently the company is following guidelines in the Standard Specification for Design & Performance of a Light Sport Glider (ASTM F2564) that's now tacitly accepted in many territories.

Cost? Final prices are yet to be announced, but it's clear from the design choices made and the manufacturing methods adopted that ProAirsport's objective here is to come in at the EASA-free light end of the self-launch market, at significantly lower retail than any other mainstream self-launcher. I have the impression that this experienced team has put together a very do-able project.

I came away from my visit to ProAirsport completely converted to the idea. Imagine owning a self-launching microlight sailplane, free from regulatory hassle and able to take-off from any reasonable field or strip. It could revolutionise soaring for many pilots, particularly those who either can't get to the gliding club as often as they like. As it says on the website, convenience, simplicity, independence and lower cost can make the 'Fly More, Fly for Less' idea a real possibility.

So taken was I with the project that as I left I gave my card to Roger and said that if ProAirsport needed any help with the test flying programme I'd be delighted to help… ■

BASIC STATS

Span 13.5m
Length 6.3m
Empty Mass c.180kg
MTOM 300kg
Load Limits +4g/-2g
Max L/D about 36 (estimated)
Min Sink about 120fpm (estimated)
Turbine Titan, max thrust 390N
Electric Motor Customised, Peak take-off output 7kW
Batteries Capacity options