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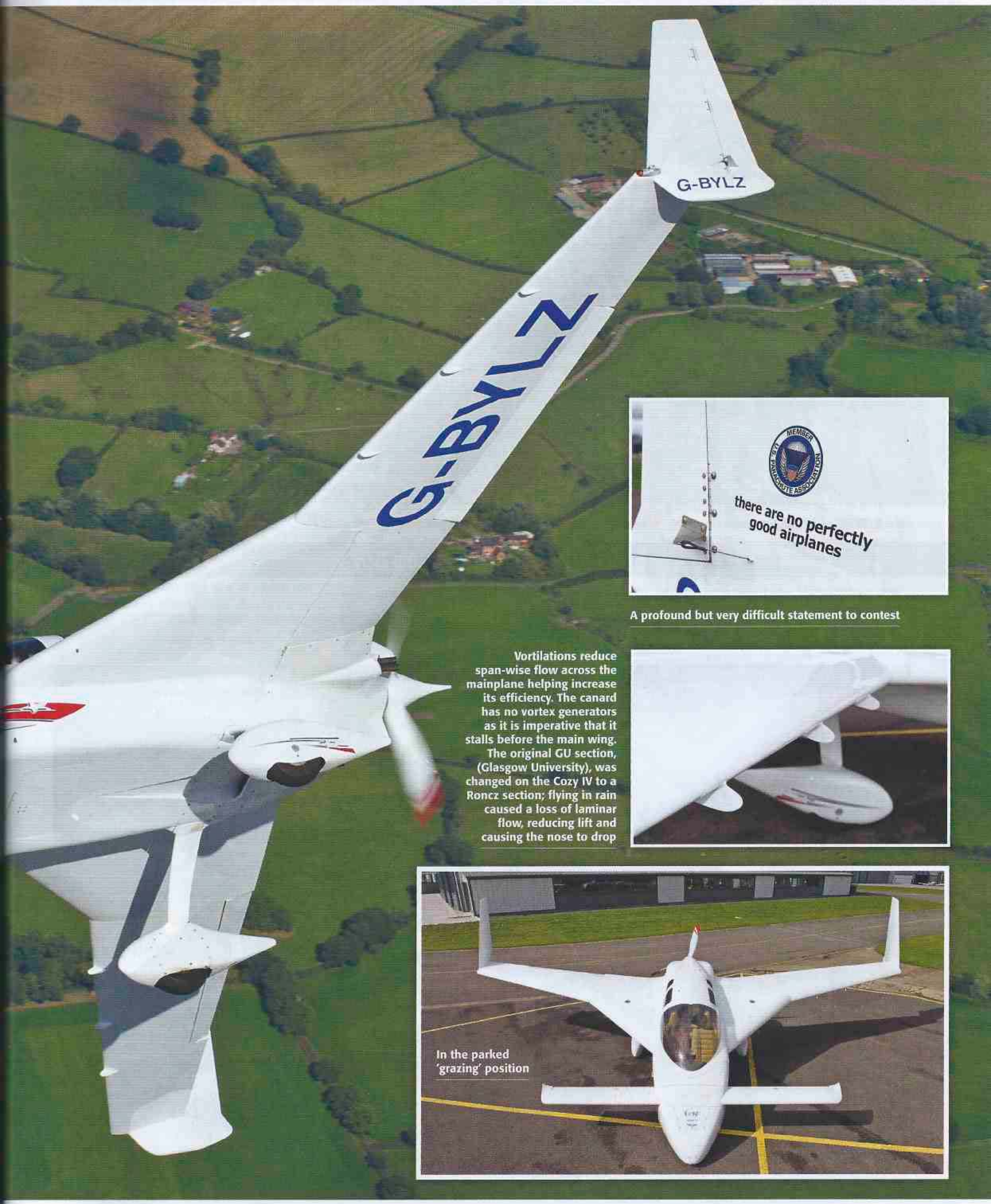
Staring skyward as a child at early PFA strut events, the image of the futuristic shape of a Rutan canard entering the circuit, and then to be found 'grazing', parked nose down in the grass, has never left me. To a young boy, they looked like something out of Star Wars. Despite the age of the design, now a classic according to the car world, it's no surprise that it still attracts attention and appears to have escaped the ageing process with ease.

Having flown a Vari-Eze, which much impressed me with its delightful handling and efficiency, I jumped at the chance of flying Bill Allen's Cozy Mark IV.

Bill's love of flying started with hang-gliders, including what he described as the early days of powered hang-gliding... bolting on a 'strimmer' and operating the throttle with your mouth. His flying moved on when he earned his licence at Staverton between 1972 and 1978. As an apprentice of the British Motor Corporation, Bill looked to put his technical skills to a good use and wanted to build an aircraft. It simply had to be the futuristic-looking Rutan design. Plans in hand, Bill started his affair with canard aircraft by embarking on the build of a Long-EZ in 1980, completing it in 1984. He chose the Long-EZ for several reasons, one being it was a machine for travelling. With a 180-litre ferry tank bolted in the rear seat, and with many proving flights in the logbook, including one non-stop to Ibiza, Bill set out to fly the EZ to Oshkosh. He described the ferry tank as giving the aircraft 'transatlantic range', thus alleviating the worry of running close on reserves when reaching destinations on the northern route across to the USA.



A profound but very difficult statement to contest

Vortilations reduce span-wise flow across the mainplane helping increase its efficiency. The canard has no vortex generators as it is imperative that it stalls before the main wing. The original GU section, (Glasgow University), was changed on the Cozy IV to a Roncz section; flying in rain caused a loss of laminar flow, reducing lift and causing the nose to drop

In the parked 'grazing' position

Radio-controlled origins

THE ROOTS OF the Cozy can be traced back to 1967 when Burt Rutan, apparently inspired by the Saab Viggen, designed and built the VariViggen from Sitka spruce and birch plywood, stapled and glued together with epoxy. It eventually flew in 1971, after proof of concept by building a radio-controlled model, after the aircraft had been built! The VariViggen, complete with retractable gear, was so futuristic-looking at the time that it featured in the movie *Death Race 2000* filmed back in 1974.

The Vari-Eze design grew from the VariViggen, but the construction method was radically changed to a moldless composite technique which was deemed to be 'Vari-Eze' to build. Plans were first available for sale at Oshkosh in 1976. Its popularity led to the development of the longer and wider Long-EZ, which first flew in1979.

The Cozy story begins with Nat Puffer who, like many, was hooked on the Rutan Design when an article appeared in *Popular Science* on the Vari-Eze. After building his own Vari-Eze, Nat was looking for a roomy cockpit canard and spawned the idea of modifying a Long-EZ to build a wider fuselage.

This required a major redesign, widening the fuselage to 38in at the shoulders (the same as a Beech Bonanza), with the original configuration being two seats in the front and one in the rear. The wider fuselage required extra reinforcement, which was accomplished by running a keel the entire length of the fuselage. This had the advantage that it provided a routing for a heater duct, wiring and control cables. One can only assume Burt Rutan was sceptical of Nat's redesign as it completely threw away the practicality of his original design. Rutan has purposely positioned the pilot at the front for weight and balance issues, with the variable load of fuel, passengers and baggage being positioned around the C of G. The Cozy would really have made more sense if it was configured with one seat in the front for the pilot, and two in the back for passengers, but I can only guess this was for sociable reasons.

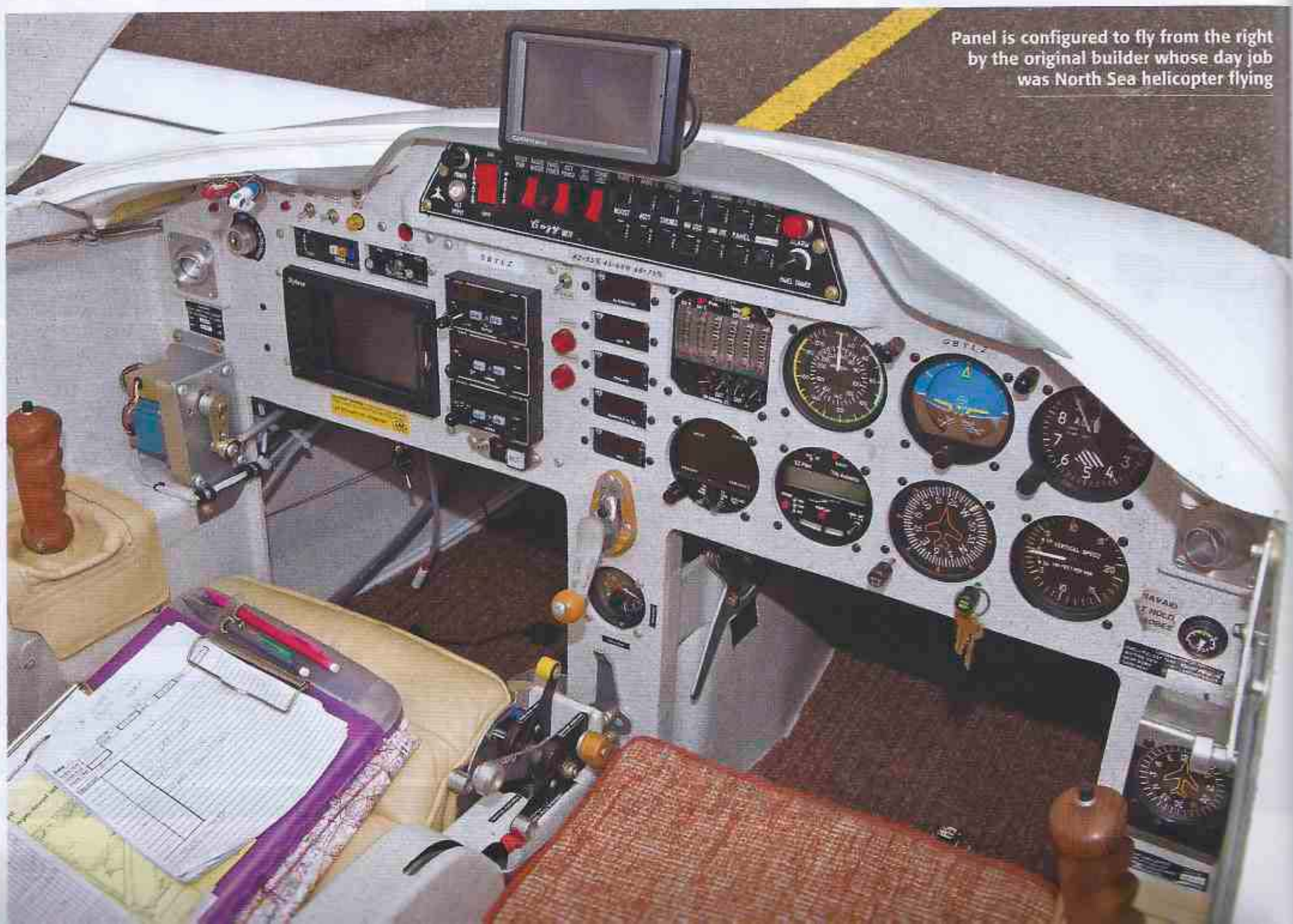
There is confusion in the Cozy range due to the existence of three variants. Nat's original design is referred to as the 'Cozy' or by others as a 'Cozy III' because it seats three. Further confusion is caused by the 'Cozy Classic', which was a development of the original Cozy but with a slightly larger fuselage and a front-hinged cockpit canopy. This was also a three-seater. (There is only currently one Classic registered in the UK.) The 'Cozy IV' is also a development of the standard Cozy, but as the name suggests is a four-seater. (G-BYLZ is currently the only IV registered in the UK.)

Because the LAA deems that the Cozy series does not meet the design standards for three- and four-seat aircraft, and haven't yet been proven in the UK, they are all restricted to two-seat operations only. Along with this restriction, the mtow has been reduced from the original design: Cozy and Cozy Classic 1,650lb, Cozy IV 1,800lb.

'slick' aircraft. I asked to try a stall, but this is a misnomer, as the only stalling that occurs is the canard. The mainplane, if the aircraft is properly built, will never stall before the canard, making the aircraft design very safe. Stick hard back results in the canard nodding. Minimum speed achieved is 57kt as the canard stalls; as the nose nods the speed builds to 62kt before the canard starts to fly again and climb, nose-up, back towards 57kt. As the main wing is never stalled, full roll control is maintained throughout with a rate of descent nowhere near that of a conventional aircraft held in this steady state.

If you do forget you are flying something that resembles a spaceship or a drone, the Cozy is a very easy and rewarding aircraft to fly, demanding no specific pilot skill, save planning for the arrival because of the slipperiness of the airframe.

Joining the circuit, the nose-gear can be deployed up to 140kt, but the speed just makes hard work of it, so extension below 120kt is preferable. Nose-gear fully extended at 90kt is the aim. With the airbrake deployed on base leg, a slight rumble is felt and the noise of the springs vibrating can just be heard. The drag of the brake is welcome, helping keep speed on final at 80kt. Excess speed on final would mean far too much runway being needed; speed control is very important. Bill likes to fly the approach steeper than the standard 3° to ensure the runway is made if the engine quits; surprisingly, the book claims around 13:1 glide ratio with a windmilling or stopped prop, or 17:1 with the engine at idle, which with the airbrake stowed makes for a far better ratio than most conventional craft. Touchdown is aimed for at 65kt, aft stick is held to keep the loads off the nose gear if braking is required.



Panel is configured to fly from the right by the original builder whose day job was North Sea helicopter flying

Efficient tourers

Bill is clearly a big fan of aviation, and is most definitely a canard man. Currently, he has two Long-EZ projects in his hangar: a turbo-normalised model using the manual Rajay system employed by Piper on the twin Comanche, and a Wilksch diesel version.

Bill's original Long-EZ project, G-WILY, now resides in Florida. Registered N99BA, it now enjoys the privileges of night and IFR flight. Back in the UK, Bill is waiting for IFR and night operations for homebuilts, fully intending to fit the Cozy with Garmin glass panel avionics.

The Cozy offers great touring ability, with masses of space for luggage. He groans at the mention of grass runways; the Rutan designs and the Cozy variants are efficient travelling machines and should be used as such in his opinion. For Bill, travelling into Europe is the way to go, and to be fair, there are not many grass strips in France.

Having owned numerous aircraft types, including most recently an RV-6, G-GRIN, he has a balanced experience of the competition, noting that the RV has 400lb less payload for about the same mpg at gross weight as the Cozy IV. The RV is a good comparison; it is very much the aircraft of choice at present, in the same way the EZ designs were back in the 80s. Rutan's designs have appeared to be lacking of late at fly-ins, but it was very good to see numerous grazing canards at this year's LAA Rally.

Bill has the last word. Resplendent on the fin of his twin Comanche and on one of the fins of the Cozy, he has a sticker pronouncing: There are no perfectly good aeroplanes. I have to agree – the mission dictates the aircraft, and then the selected aircraft will be the best compromise. ■

What makes a canard efficient?

CONVENTIONAL AIRCRAFT HAVE a smaller flying surface at the rear. Its job is to counterbalance the pitching moment produced by the mainplane by applying a downward, opposing force. Many argue that this actually makes the aircraft heavier; this is arguable as the moment is already in existence whatever the layout... in canard designs, the small flying surface is ahead of the main wing, and therefore counteracts the moment by producing lift in the same direction as the mainplane. Thus it is said the canard adds to the overall lift, making for a smaller mainplane.

These points can be argued all day, but one thing is for sure: where there is lift there is drag, an inescapable fact whatever the layout. The pusher configuration favoured by most canards has many negatives, mainly associated with prop strikes and prop FOD damage, but as a positive it allows the fuselage to be designed as a lifting body, meaning smaller wings can be used.

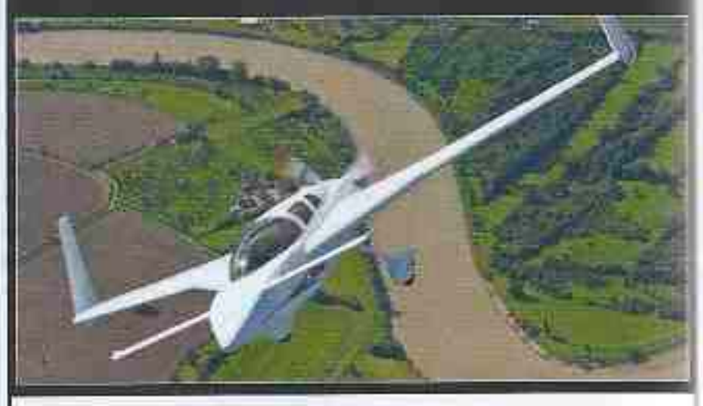
The drag from the fuselage is mainly from lift and not from parasite drag, as with conventional fuselages. A smaller mainplane and the general layout of the cabin means that a smaller canard is needed when compared to a conventional tailplane. This all adds up to less drag, making for a slippery aircraft.

As we've seen, all aircraft are a compromise and canards are no exception. The efficiency of the design, including low-drag laminar-flow sections made possible by the composite construction, makes for higher landing and rotation speeds, which means more runway is required. That said, if designed properly, the canard configuration makes for a very safe, unstallable and unspinnable aircraft.

The canard is set so that it stalls before the mainplane. Once stalled, the pitching moment of the unstalled mainplane forces the nose to drop, at which point the canard starts to fly again repeating the process resulting in a gentle nod and a moderate rate of descent. This means the aircraft can never be flared to a point where the main wing stalls just at the point of touchdown, as with a conventional aircraft, thus making for higher landing speeds.

TECH SPEC

Cozy Mark IV



DIMENSIONS
Wingspan 28ft 1in (8.56m)
Length 17ft (5.2m)
Height 7ft 11in (2.4m)

WEIGHTS & LOADING
mtow 2,050lb (930kg)
Max useful load 1,000lb (453kg)
Fuel capacity 52usg (197lt)

PERFORMANCE
Cruise speed (at 75% power) 165kt (190mph)
Stall speed (pitch bob) 58/61kt (66/70mph)
Best rate of climb 1800fpm
Range 1350nm (1554m)

ENGINE
Lycoming O-360 180 hp

SEATING
4

PRICE
$18,000 plus engine and avionics

CONTACT DETAILS
www.cozyaircraft.com

Main gear is fixed because of its low drag design. Retractable versions do exist, but often there is little or no gain by making main gear retractable if designed efficiently. Complexity is added and payload lost