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CH 750

The beauty that lies under the ugly duckling skin of Zenith's STOL kitplane

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Zenith's STOL Kitplane

Turning the old idea of 'if it looks good...' on its head, the CH 750 puts function before form - but what fantastic function it offers!

Words *Dave Unwin* **& pictures** *Jim Lawrence*

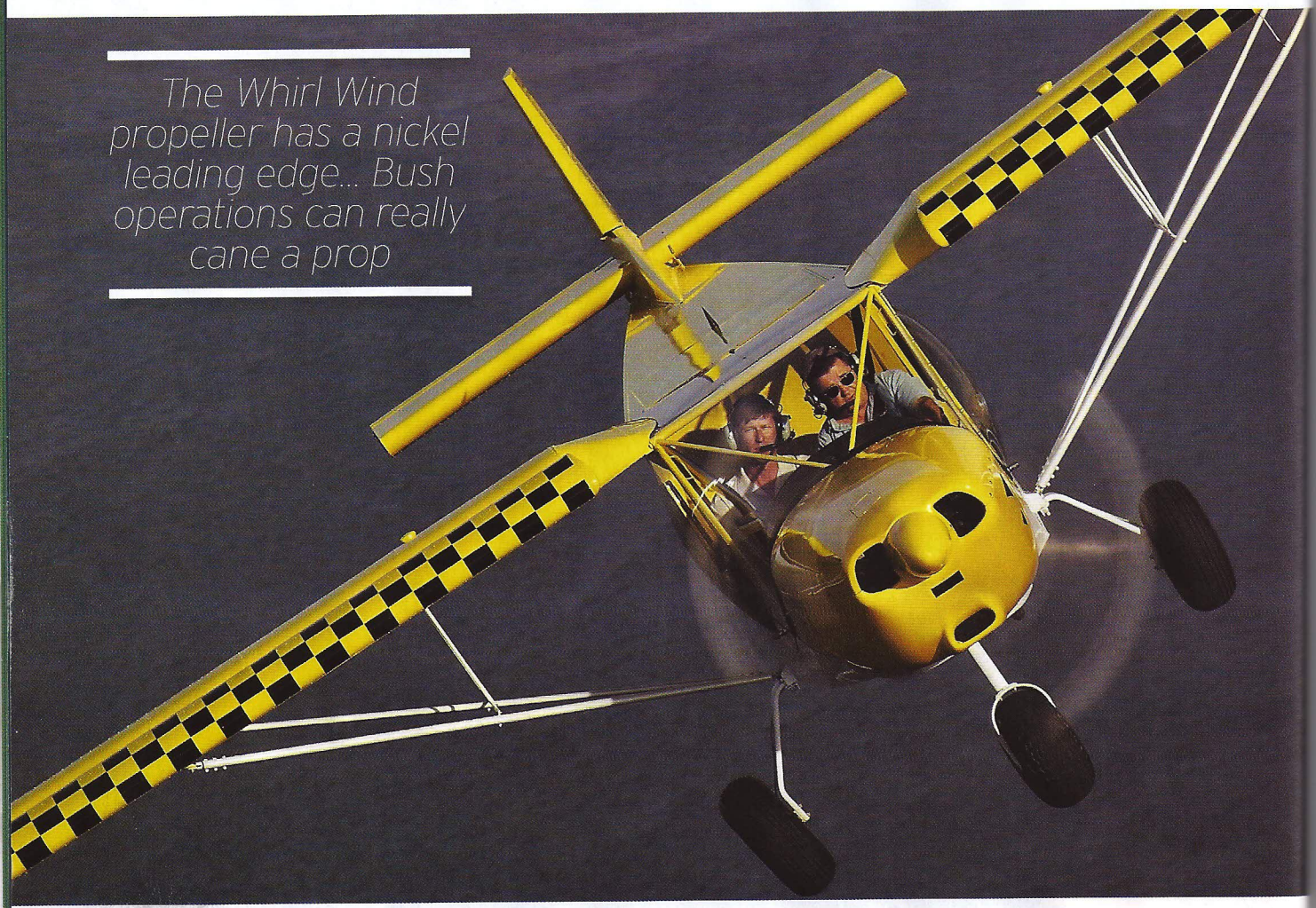
With the slats maintaining a tenacious grip on the airflow and the big flaperons completely lowered, it really seemed as if we were just hanging in the air. We were smack into wind, so as the speed bled away I added just a bit of power, more nose-up trim, and looked out of the side window. "Do you know something Roger," I said, "I think we might be going backwards!" "Well," he replied, "I did say that you can fly this thing mighty slow!"

From a distance the STOL CH 750 does rather resemble the slightly smaller STOL CH 701, an aircraft that I flew with Zenith pilot Roger Dubbert at Sun 'n' Fun in 2001. Although the family resemblance is obvious, Sebastien Heintz (Zenith CEO and son of designer Chris) emphasised they are different aircraft that, with the exception of the all-flying rudder, have practically no interchangeable parts. The test aircraft was registered in the Light Sport Aircraft (LSA) class, and consequently has a 600kg MAUW. It is allowed an extra 53kg when registered as Experimental (USA only). Upon approaching the machine my initial impression was that form had clearly followed function – good looking it isn't. However, beauty is only skin deep, while ugly goes right to the bone (or main spar).

Although I usually start my inspection at the spinner, I was particularly intrigued by the wings and tailplane. The strut-braced wings are interesting, as the leading edges feature full-length fixed Handley-Page type slats, while the trailing edges are covered by full-span metal-covered slotted Junkers-type flaperons. These are infinitely variable between 0° and 15°, and are actuated electrically. Seb had emphasised that the machine had an impressively low stall speed, and looking at the slats and flaperons I could clearly see why. I also spotted the sizeable slot between the trailing edge of the wing and the leading edge of the flaperon, and wondered if this also allowed the flaperons to function as a sort of 'Fowler flap' when they were lowered. The aerofoil is a high-lift section and is quite deep with a flat under-surface. The wing has no wash-out; instead as the flaperons are made in two parts and then joined with splice plates the outer sections are set at a lower angle of incidence than the inner parts. The wingtips are of the Hoerner type and feature LED position and strobe lights. LED taxi and landing lights can either be located in the nose or recessed in the leading edge slat.

In many respects, the wing actually reminded me of Peter Holloway's Fieseler Storch that I tested a few years ago, and I was interested to learn that the original Fieseler Storch design served as the inspiration for the Heintz STOL series aircraft. The wing is certainly very different from most GA


EXPERIMENTAL
STOL CH 750



The Whirl Wind propeller has a nickel leading edge... Bush operations can really cane a prop

aircraft, as is the tail section, which features more intriguing aerodynamic anomalies. Firstly, the tailplane is an inverted aerofoil, while the elevators are fitted with micro vortex-generators. The reasoning behind the inverted aerofoil is that as a STOL wing can fly at very high alpha, more downforce is required on the tail. An electrically-operated trim tab covers the entire trailing edge of the port elevator. The method used for directional control and stability is typically Zenith, being a small dorsal fin and sweptback all-flying rudder. As well as being slightly smaller than a conventional fin and separate rudder, this arrangement also provides more control authority as the moving part is substantially bigger than a separate rudder. Another reason that it exerts more influence is that it has a proper symmetrical aerofoil section. This is especially useful for STOL operations at slow speeds, and crosswind take-offs and landings. All the controls are cable-operated except for the pushrod-actuated aileron/flap controls.

In complete contrast to its advanced aerodynamics, the CH 750's construction is entirely conventional. The aircraft has a semi-monocoque airframe, and is built primarily of 6061-T6 aluminium sheets, fastened together primarily using Avex blind rivets. The wing spars and lower cabin frame are supplied completely factory-riveted with conventional 'AD' bucked rivets. The wings, tailplane, elevators and all-flying rudder are made from stamped aluminium ribs and covered with anodised sheets of 6061-T6. Being a larger and heavier aircraft than the 701, most skins are of thicker 0.020in and 0.025in aluminium sheets. All the kit parts are supplied pre-cut, formed, and match drilled by CNC machine – ready to be 'Cleco'd' together. There are a few chrome-moly steel components, such as the control system, nose leg and top cabin frame. These are all supplied factory-welded and ready for assembly. Composites are used for the Hoerner wingtips, cowling and fairings.

All the fuel is carried in integral welded aluminium fuel tanks, one in each wing's leading edge near the wing roots (supplied ready-to-install in the kit). They have a combined capacity of 91 litres, and can feed a variety of different engines, as the CH 750 has the same set-up 'firewall forward' as the 650 (see *Pilot* May 2012) and consequently can accept the same wide range of motors. The test aircraft was powered by a Jabiru 3300 air-cooled flat six. This produces 120hp at 3,3000rpm, and turns a two-blade Whirl Wind propeller with a nickel leading edge. Bush operations can really cane a prop, and I imagine that the extra protection provided by the nickel covering greatly extends the prop's longevity.

Access to the engine bay is adequate. The composite cowling splits horizontally but screws are used all the way around. While this is fine for the bottom half, I'd prefer Camloc fasteners for the top. The oil can also be checked via a small hatch.

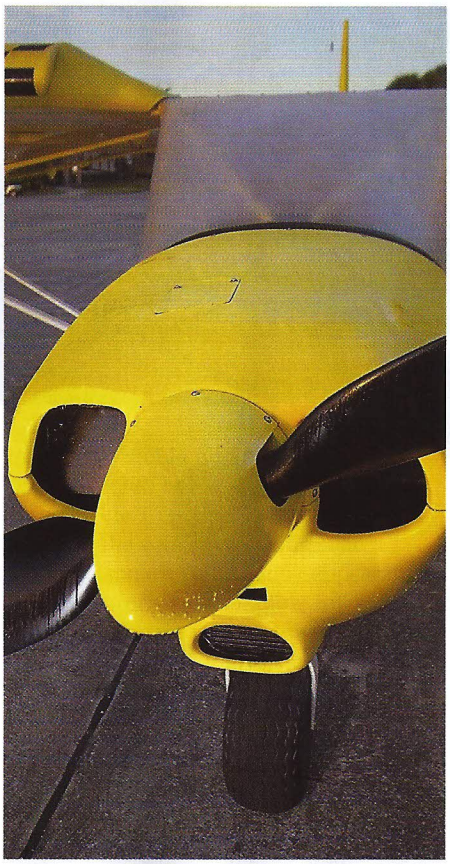
I liked the look of the undercarriage, which is conventional in both design and construction, and very rugged. The main undercarriage is a single-piece double cantilever aluminium leaf-spring, which is bolted directly to the underside of the fuselage. Simple, rugged and essentially maintenance-free, it's the perfect arrangement for a flying SUV. Unusually for a bushplane, the third wheel is at the nose, and is suspended from a very beefy looking strut. I was a little surprised it's

Above: adjustment of standard seats requires a spanner. Sliding seats are an extra-cost option

Right: while we'd have expected a weight-saving taildragger configuration, the company prefers the easy handling offered by a tricycle undercarriage

Below: no analogue stand-by instruments are to be found on the panel of the US-spec aircraft tested. Note that although N750NC has a centre stick and the throttle and brakes are only on the left, separate throttles, sticks and brakes for each seat are options.

Below right: one further bit of characteristic Heinz functional design – the Y-shaped central stick is shared between PIC and passenger/co-pilot. Simple but effective...



not a taildragger, but Seb explained that the company prefers the tricycle undercarriage for improved forward visibility on the ground and better ground handling. Furthermore, nearly all new pilots are familiar and comfortable with the tricycle undercarriage configuration.

The steerable nosewheel is directly connected to the rudder pedals and uses a bungee for shock-absorption. All three wheels are un-spatted and use the same big 800 x 6 size tyre.

Overall, I'd say that the CH 750 is intelligently designed and very well made. Furthermore, although I appreciate an attractive aeroplane as much as the next pilot, I do enjoy machines that have been designed with functionality foremost. After all, the classic Willys Jeep is no beauty queen, yet is allegedly credited by General Eisenhower as being one of the four machines that won WWII. In fact the Jeep analogy is rather apt, as the test aircraft had 'Sky Jeep' painted on the cowl. But was the CH 750 worthy of the name? I couldn't wait to find out!

Access to the cockpit is good. The sills are nice and low, the large gull-wing doors open wide and are supported by well-damped gas struts and there are sensibly-sited grab-handles. As the CH 750 is approved for flight with the doors off, they can be removed easily and stowed in the baggage bay. The cockpit is roomy and utilitarian, and while the seat can be adjusted it does require a spanner. This is not, in my opinion, an ideal arrangement, but adequate for owner-pilots. Adjustable rail-mounted seats are now an option.

The non-adjustable pedals pivot from the floor and actuate the rudder by cables and the nosewheel via pushrods. With the doors swung shut two things immediately impressed me – the width of the cockpit and the excellent visibility. I had already got the impression that, for an LSA, the CH 750 boasts a remarkably spacious cabin. However, it was only with the big doors closed that I really appreciated just how large it is. Not only is the cockpit

Above: the generously glazed doors and deep windshield give an almost unbeatable view among fixed-wing aircraft

106cm across at the shoulders, but because the doors actually bulge outwards at their widest point the CH 750 is an astonishing 127cm wide. This is not only impressive for an LSA – it is actually greater than many four-seat GA aircraft. For example, the maximum width of a Cessna 172's cockpit is only 100cm. The extraordinarily spacious sensation is enhanced by the considerable amount of glazing all around – even behind. The forward field of view is also very good. Many high-wing designs are cursed with a blindspot in the turn, due to the proximity of the wingroots to the windscreen. However, as the CH 750 has a sort of gull-wing design at the wingroots, the field of view in the turn is much better. Furthermore, because the instrument panel is not as wide as the cockpit, the field of view down each side of the nose is also good. Finally, the windscreen is also generously proportioned. For a high-wing design, the field of view is excellent.

Continuing my exploration of the cockpit, I found many features that I approved of, and a few that I didn't. For example, each harness only has three anchor-points, and for a bushplane it should have four. I also thought that the controls operating the choke, carb heat and cabin heat were too similar, in both appearance and movement. I'd also like the fuel pump switch to be different from the other electrical services. Finally, I think that the flap switch should be flap shaped. (And of course, as a kit aircraft, each builder is free to configure the panel and engine controls the way they prefer).

On the plus side, I liked the arrangement for the master switch and ignition (split rockers for *ALT/BAT*, and a key-operated rotary switch for the mags and starter) and also how the rocker switches for the electrical services are neatly grouped in two rows on the left of the panel, with the circuit breakers nicely delineated (there's even a separate avionics bus) on the right. I liked the location of the toggle switch for the flaps, which is located on the left side of the cockpit, next to the plunger-type throttle. Another signature Zenith feature is the Y-shaped centre-stick. This intelligent arrangement is a lightweight method of providing a stick for both pilot and passenger, and also makes it easier to get in and out. (A dual stick option is also available). The test aircraft had several functions built into the P1's stick top, including buttons for pitch trim, PTT, Control Wheel Steering (CWS) and A/P disconnect. A small column extends down from the base of the instrument panel and joins up with a centre console that extends aft between the seats. This carries the fuel cock; both tanks feed simultaneously.

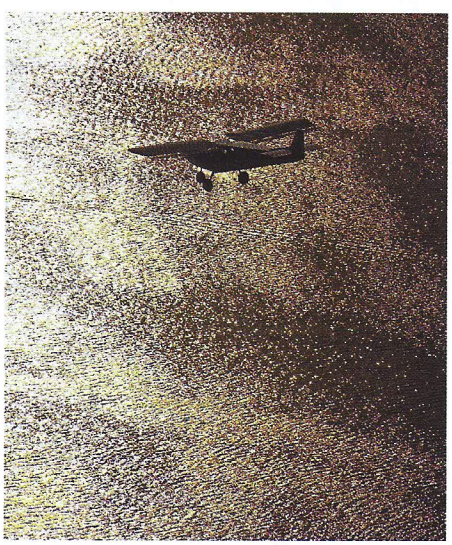
Behind the seats is a large baggage bay, which can hold up to 22kg with the Jabiru installation. As the seats, fuel tanks and baggage bay are all concentrated around the C of G I would imagine that balance issues are unlikely to be a problem – an excellent safety feature.

The CH 750 boasts a remarkably spacious cabin – an astonishing 127cm wide

The panel is entirely digital, with flight, engine and navigation data all displayed on a single ten-inch Dynon Skyview MFD. The other avionics are a Garmin Aera 560 in an AirGizmos dock, plus a GTX327 transponder and SL40 Nav/Com.

With Roger in the right seat, we taxied out. Ride quality was good, the nosewheel steering felt very precise and nicely weighted, while the toe-operated hydraulic disc brakes are powerful and progressive and the view over and either side of the nose excellent. It is an extremely easy aircraft to taxi.

The takeoff was impressively brief, indeed we were flying almost as soon as we started to roll. Climbing out at around 1,000fpm, my initial impression was that the visibility really is very good. The steeply raked windscreen, bulged Lexan doors and rear transparency really do give it a very airy feel. In fact, it might almost feel a little too exposed for some passengers. As Sebring was very busy with show traffic, we thought we'd fly over to Placid Lakes, which we knew would be quiet. This would also give me the opportunity to land on grass. As soon as we were clear of Sebring, I began to examine the general handling. The aircraft's somewhat ungainly appearance belies a surprisingly sprightly roll rate, while it was easy to keep the turns coordinated. Further investigation revealed forceful flaperons, an effective elevator and a powerful rudder. Breakout forces were low but control harmony is not perfect, as the elevator is perhaps a little light while the flaperons are a touch on the heavy side. However, the rate of roll is perfectly adequate, while visibility in every phase of flight really is excellent.



Above: long-legged – the 750 has an operational radius of around 190nm at 75% power, considerably more if you slow down and enjoy the view

An examination of the stick-free stability revealed the 750 to be strongly positive longitudinally, as a ten-knot displacement from a trimmed speed of 75kt produced a low-amplitude long-wavelength phugoid that damped itself out after a single oscillation. Lateral stability is neutral but directional stability is extremely strong, courtesy of that slab-sided fuselage. The pitch trim is nicely geared.

A look at slow speed flight was interesting, and as I've found with many LSA-type machines, the speed at which an unaccelerated 1g stall occurs is difficult to determine as the ASI is so inaccurate, due to position error. The POH claims that with the flaperons lowered to 15° and the throttle at idle the 750 stalls at about 30kt. I have no reason to dispute this claim. The pre-stall buffet was mild, while the ridiculously high deck angle is a strong cue that perhaps not everything is as it should be! Recovery was quick and easy, with little loss of altitude. I decided to hold the aircraft in a stall, and with the stick on the back stop it simply sank straight ahead in a very stable condition with a vertical speed of less than 500fpm. You could ride it right down to the ground like this, and although you might burst the tyres you would definitely walk away. This is a very safe aeroplane.

I tried a few stalls in the turn, and the aircraft responded by always rolling the wings level – an excellent trait. I also experimented with some gentle 90° turns just above the stall, and discovered that the flaperons work well even at such slow speeds. A minor niggle was that I felt like I was running out of aft trim at slow speed, but the C of G was fairly forward. And, to be fair, slow in this aeroplane is really slow. I doubt it would be an issue.

As we cruised along it occurred to me that the CH 750 is actually faster than it looks. A high cruise speed of 85kt is perfectly achievable – and sustainable, albeit rather noisy and thirsty. Around 75 is a more practical speed. Ride quality is ➔

SPECIFICATION

ZENITH STOL CH 750 £40K

DIMENSIONS

Length	6.70m
Height	2.64m
Wingspan	9.10m
Wing area	13.37sqm

WEIGHTS AND LOADINGS

Empty weight	351kg
Max AUW (LSA) 600kg	(Exp) 653kg
Useful load (LSA) 249kg	(Exp) 302kg
Wing loading	(LSA) 44.87kg/sq m
	(Exp) 48.84kg/sq m
Power loading	(LSA) 6.74kg/kW
	(Exp) 7.33kg/kW
Fuel capacity	91 litres
Baggage capacity	90kg

PERFORMANCE

Vne	109kt
Cruise	87kt
Stall	30kt
Climb rate	1,000fpm
Service ceiling	14,000ft
Range	400nm

ENGINE AND PROPELLER

Engine Jabiru 3300 air-cooled flat six producing 120hp (89kW) at 3,300rpm.
Propeller Whirl Wind 65-inch (165cm) two-blade ground adjustable pitch.

MANUFACTURER

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good. Some STOL planes have very low wing loadings, which can mean a very bumpy ride in thermic or turbulent conditions, but with a maximum wing loading of 44.87kg/sq m the 750's is not excessively low. The superb STOL performance is all done with the flaperons and slats. Although it can cruise as fast as 87kt, this does need a lot of power. Maximum range (including VFR reserve) is about 380 nautical miles.

A couple of circuits at Placid Lakes confirmed that STOL performance. I noted that in common with many LSAs, at 65kts the Vfe is lower than I like. On final I initially used 55, and bled it back to 50. I tried one approach at 45, and on very calm days you could probably shave another five knots off, but it does bleed energy rapidly once you flare and close the throttle.

I was beginning to like this machine, it really is an aerial SUV so let's take a look at the numbers for range and payload. Firstly, it is fundamental that any aerial SUV must have the ability to go somewhere and back again on internal fuel only, while carrying a useful load. I've always felt that the numbers for range and endurance are more important than speed when testing utility-type aircraft, with particular emphasis on the aircraft's operational radius. After all, it's pointless to plan an exciting camping trip to a remote strip in the Highlands if you can't carry either all your camping gear, or enough fuel to come home again, as one must never assume there'll be suitable fuel available. So, let's do some planning. We will need full fuel tanks, so let's fill up with 64kg of gas. As the useful load is an excellent 249kg, even two 80kg adults still have 25kg for all their gear. Now, where can we go? A quick spin of my trusty E6B soon revealed that the CH 750 has an operational radius of around 190 nautical miles at 75 per cent power – considerably more if you slow down and enjoy the view. Pretty impressive numbers by anyone's standards, I'm sure you'll agree.

In conclusion, I was hugely impressed by the STOL CH 750. In many ways an excellent example of 'function over form', its STOL performance is remarkable. I flew it on a flat-calm day and was amazed at how little runway I used, and this was the first time I'd ever flown one. I would imagine that with a few hours on type, and say 20kts on the nose, you could land (and equally importantly – take off again) practically anywhere. ■