

RECREATIONAL FLYER

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Elevated:
Angus Watt's CH-750





The original Zenith 701 was designed as an ultralight go-anywhere all metal bush plane that could be plans built by anyone with a 4 ft tabletop bending brake and a pair of snips. It was rarely described as a thing of beauty but so well does it fulfill its mission that these planes are found all over the world. They are inexpensive to construct, and because of their leading edge slats they can get in and out of extremely short patches of clear ground.



WANTED:

ANGUS WATT'S CH-750



WITH THE ADVENT of the Light Sport category in the US, Chris Heintz saw the need for an updated version, something with a larger cabin, greater payload, and the ability to use an array of four stroke engines. The CH 750 was the result and its lineage is visually apparent but while the new plane resembles the 701 it is almost completely different in construction. CNC fabrication methods have made it possible to simplify the design, speed up the construction, and end up with a larger and faster plane at only a slight weight penalty.

The CH 750 has a wider and longer cabin with adjustable seats and luggage space for camping gear and a week's supplies. The fuselage is longer and the horizontal flying surfaces have greater spans,

and the only part interchangeable with the 701 is the signature Zenith all-flying rudder. Formerly the skins were all .016" and they are now .020 to handle the greater mass of the range of possible four stroke engines and the 1320 pound gross weight on wheels, 1430 on floats.

Chris Heintz correctly surmised that the US Light Sport category would be attractive to aging American pilots who wanted to bargain down to their Sport Pilot category that allows a valid driver's license to be used as proof of medical. These pilots would want to fly behind a familiar powerplant with which their mechanics would be familiar, so Continental put the O-200 on a diet and shaved nearly 40 pounds from the old standby engine. In ►



the US this is the engine of choice for the CH 750, but in Canada the preference is for Rotax 912S and Jabiru 3300 six cylinder.

Zenith's 701 was notable for its combination of leading edge slats and full length Junkers flaperons. These allow a higher wing loading than is usual for light planes because the slats and flaperons combine at high angles of attack to provide a lift coefficient of over 3. This wing loading is appreciated on gusty days when a conventional light plane will be bouncing around in the air, while the 701 will be stable.

The CH 750 has the same flat bottomed high camber airfoil but it places the leading edge slats at a flatter angle, while the flaperons have one inch more chord, resulting in 2" greater overall chord, now 58". The new wing's 8" tall main spar now comes

completely built and has a thicker shear web, .032" vs .025, and spar caps of 1" angle instead of the 701's 3/4".

In the CH 750 kit Zenith uses their CNC machinery to drill all wing, control, and tail skins, plus they drill the mating holes for the spars and ribs. The spars and ribs also have one side match hole for quick assembly but Zenith leaves the top spar cap and rib flanges to be drilled by the builder, a concession to the requirement for the builder to do 51% of the work. The tail goes together the same way with one side predrilled and the other to be done by the builder.

The leading edge slats have always been the defining element of the Zenith 701 and they have also been the devil to build, normally taking a few weeks per side to jig and align, assemble, and finally rivet. Zenith has now predrilled every part of the flaperons and a full set can be completed in a weekend, a much appreciated timesaver.

The Junkers flaperons are unique in that they are split halfway down their length and joined by splice plates. The CH 750 has no washout in the wing so it can be final-assembled on a flat table. Washout is provided by the flaperons themselves with the outer sections being at a lower angle of incidence than the inner sections. As before, the full length flaperons are actuated by pushrods that go to the reinforced root rib.

The horizontal stab is unusual in that it is an asymmetric inverted airfoil. The purpose of the stab is to provide downforce to counter the pitching moment of the main wing, and an inverted airfoil can provide this downforce with less incidence so it will have less drag. New is a servo actuated full length adjustable trim tab that is fitted to one side of the elevator. Optional are VG's that may be riveted to the lower edge of the elevator to lower the stall speed to the high 20's.

The all-flying rudder is also common to Zenith designs and the one on the CH 750 comes straight from the

701. An all-flying rudder is lighter and much simpler to build than a conventional fin and rudder assembly. Some have asked how a plane with an all-flying rudder can have such good yaw stability and Heintz explains that the slab side of the fuselage provides the yaw stability normally supplied by a vertical fin.

The fuselage of the CH 750 has been considerably enlarged from the 701. The firewall comes straight from the 601 series and is 8" wider, and it is now 6" further forward to provide lots of legroom for tall pilots. Although most of the fuselage structure is aluminum, the flight and landing loads are taken through steel components. The forward wing carrythrough is part of the 4130 tube weldment that includes the upper cabin longerons and the forward "seaplane" braces that marry into the centre support of the motor mount.

The streamlined lift struts and landing gear are attached to steel weldments that bolt into the cabin's lower longerons. These are larger than those

on the 701 because the aluminum gear itself is now 6" wide instead of 3-1/4" to accommodate the considerably higher gross weight.

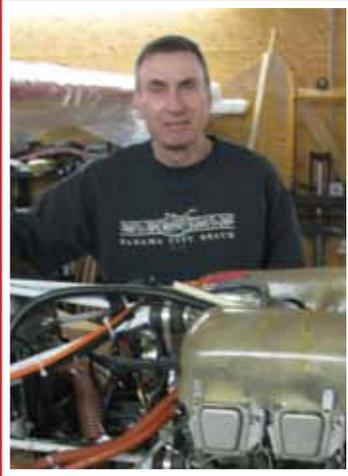
Besides being longer, the cabin is now 42" wide at the shoulders and with the swing-up bubble doors the elbow room is 50". At the panel the cockpit is now 38" wide instead of the 701's 34" making it much easier to get in and out of the plane. The seats are now separate pieces, no longer part of the structure as they were in the 701, and Zenith has made them fore and aft adjustable. It takes a wrench to do this but it is now possible to fit a range of pilots comfortably.

As is common in Zenith aircraft the CH 750 has a single stick control and dual throttles on the panel. Pilots fly with the right hand on the stick and left on the throttle. Instructors ▶



CHRIS HEINTZ SAW THE NEED FOR AN UPDATED VERSION, SOMETHING WITH A LARGER CABIN, GREATER PAYLOAD, AND THE ABILITY TO USE AN ARRAY OF FOUR STROKE ENGINES.





WHEN HE RETIRED in October 2009 from his military career, Angus Watt held the rank of Lieutenant General, Chief of Air Staff, and he commanded Canada's Air Force. Most of his Air Force flying career had been in helicopters, usually sea Kings and Jet Rangers, so when he decided to build his own plane he went looking for one with good STOL characteristics. After surveying the market he decided that an all metal design would be most useful, and of these the new Zenith CH 750 best fit the bill. This stressed skin aluminum plane has ample leg and shoulder room plus a large luggage area, and with the clear bubble doors and cabin roof it offers the visibility of a helicopter. Most of the parts in the CH 750 kit feature CNC match hole technology so it goes together quickly, and alignment of critical components is easily achieved. Angus was looking for a kit that could quickly become an airplane and in January 2010 he made his first flight. Within two weeks he had flown off the 25 hours and made his last takeoff for awhile from CYKF enroute to his home base near Ottawa. Many of us walked out to the flight line on that cold day to watch his takeoff and to hear the sweet sound of the six cylinder Jabiru at full throttle.

do the opposite. Rudder pedals are provided for both sides but brakes are only on the left unless optional right side master cylinders are ordered. Elevator and flaperon trim are now by electric servo motors that are included with the kit.

The cabin now has great sight lines, courtesy the large bubble windshield, clear bubble doors, and the clear cabin roof and generously-sized luggage area windows. The panel is less than full cockpit width, providing a useful view down each side of the nose when landing.

The tailcone of the CH 750 is made very light because it is required to handle only the flight loads of the empennage. There is a diaphragm bulkhead at the intersection of the cabin and the tailcone, and two more simple rectangular bulkheads at the very rear to which the stab brackets attach. The rest of the tailcone is simply four triangles of .020" sheet internally reinforced by .025 aluminum angle stock riveted in a truss pattern. New for the CH 750 are extruded aluminum longerons that have generously radiused corners and recessed flats to accept the sheet metal.

The main landing gear is formed from a plank of aluminum, and is

sandwiched in rubber sheet where it is clamped to the fuselage gearbox. Brakes are by Matco with two calipers per side, and the aluminum wheels carry large tundra tires suitable for rough field operations. The nosegear

THE HANDLING OF THE PLANE IS RESPONSIVE - AND IT'S A LOT OF FUN TO FLY.



is the usual Zenith 2" steel tube suspended by a bungee. At the bottom is an aluminum fork that holds an aluminum wheel and tundra tire. The nose gear strut tube runs in hard plastic

bushes and is directly steered by links from the rudder pedals.

Angus Watt began his build mid-October 2009 when he first opened the collection of plywood crates at the Can-Zac hangar at Waterloo Airport. Working weekdays, and with time off for Christmas he made his first flight late in January 2010, a scant three months after beginning. He found that working with the help of Mark Townsend and Ryan Gomes of Can-Zac Aviation meant that any snags could be immediately remedied. He found that the manual is still a work in progress but fortunately the kit comes with complete CAD-drawn construction plans. After all the major components were built the alignment of the plane was done the old-fashioned way with strings, levels, and plumb bobs. Having a level floor and a few extra hands made this a simple process.

The firewall forward package was supplied by Lancaster Aero, the Canadian distributor for Jabiru of Australia. The 120 hp aircooled six cylinder 3300 cc direct drive engine is CNC machined from aluminum billets and is supplied as a complete firewall forward package including the mount and the cowl. The Jabiru is carbureted by a single Bing CV

updraft carb that has automatic altitude compensation so no mixture control is required. Below the oilpan is a transverse stainless steel muffler with heat muffs for carb and cabin heat. Angus used the whole firewall forward package except that he replaced the Jabiru-supplied firewall fuel fitting with one made from an aluminum air manifold that was bought at Princess Auto. He then chose a ground adjustable Sensenich 64" composite prop to match the power curve of the Jabiru. The firewall forward required one week, with much of the time spent on fitting the cowling.

The panel of an Amateur-Built airplane is the choice of the builder and Angus decided to go with a glass

cockpit. He ordered a Dynon Flight Deck 180, Micro Air 760 radio with intercom, Bendix Aviator GPS, Garmin 327 Mode C transponder, and an ACK 121.5 ELT, all from Aircraft Spruce. Cutting and fitting the panel took two days' work with an Olfa knife for the rectangular holes and a panel punch for the round instruments. The Dynon provides almost all engine and flight information including angle of attack, however it was necessary to install a standard magnetic compass to meet the Amateur Built regulations. The CH 750 kit comes with a fuel selector but Angus replaced it with an Andair unit prominently mounted ahead of the centre stick.

The cockpit of Angus' plane is

sparse and efficient. The kit-supplied seat belts were installed and Angus ordered a set of Can Zac-manufactured seat cushions for the aluminum seats. He also installed some flush D-rings for luggage restraint and finished the rest of the cockpit with paint.

The colour scheme of a plane is always a personal expression, and Angus chose a military theme. He requested the paint codes for the military helicopters and had his plane painted in the official colours. This paint scheme is very visible, even on a hazy day, and stands out well in the circuit.

The weight and balance was performed using the RAA electronic scales. The factory claimed weight ►

SPECIFICATIONS (Based on factory prototype, equipped with 100 hp Continental 0-200 powerplant)		
WING SPAN	29 FT. 9 In.	9.1 m.
HEIGHT (rudder tip)	8 Ft. 8 In.	2.6 m.
WING AREA	144 SQ.FT.	13.4 m.sq.
WING CHORD	4 Ft. 10 In.	1.5 m.
LENGTH	21 Ft. 10 In.	6.7 m.
HORIZONTAL TAIL SPAN	8 Ft. 5 In.	2.6 m.
HORIZONTAL TAIL AREA	22.2 Sq. Ft.	2.0 m.sq.
EMPTY WEIGHT	775 LBS.	350 kg.
GROSS WEIGHT	1,320 LBS.	600 kg.
USEFUL LOAD	545 LBS.	250 kg.
WING LOADING	9.15 LBS/FT ²	44.8 m ²
POWER LOADING	13.2 LBS/BHP	6.0 kg/BHP
DESIGN LOAD FACTOR (ultimate)	+6 G / -3G	
CABIN WIDTH (shoulders)	42 INCHES	100 cm.
CABIN WIDTH (optional bubble doors)	50 INCHES	1.27 m.
FUEL CAPACITY (std., dual wing tanks)	24 US Gallons (2 x 12 gal.)	90 liters (2 x 45 liters)
STD. RANGE	400 miles	710 km.
ENDURANCE	5 Hours	5 Hours

PERFORMANCE @ gross weight		
TAKE-OFF ROLL	100 Feet	30 m.
LANDING ROLL	125 Feet	38 m.
MAX. CRUISE, Sea Level	100 MPH	162 km/h
NEVER EXCEED SPEED	125 MPH	200 km/h
STALL, flaps down	35 MPH	56 km/h
RATE OF CLIMB	1,000 fpm	5.1 m/s
SERVICE CEILING	14,000+ feet	4,200+ m.

SCUDLOR FLYER CH-750



The CH 750 is the perfect plane for exploring and camping off the beaten path...

is 750 pounds for a bare and empty plane, and this plane weighed 807 with paint, extinguisher, and ELT. The CG range is 280-500mm from the leading edge slat and this plane came out at 412mm. Fuel and crew are both near the middle of the CG range and 150 pounds of luggage and camping gear can be stowed behind the seats and the plane will still be within the CG envelope.

First flight of a newly built plane can be a surprise but on January 20th, 2010 the only unexpected event was that the vox of the radio was set too high, and on first climbout it was difficult to hear the tower. Other than that everything went smoothly. Takeoff is simple- just leave the stick neutral and push in the throttle. The CH 750 will then leave the ground with 100 ft of roll. With practice the landing may be achieved within 150 ft, so a 500 ft strip would be enough for most pilots and 1000 ft should be enough for anyone.

The factory claims a 100 mph cruise and Angus' Dynon confirms this with 85 knots airspeed. A 70 knot climb appears to be a good compromise between engine cooling and climb rate. In the circuit Angus uses a 70 knot approach to keep moving with the traffic and bleeds this back to 60 over the numbers. At this speed it is still flying and it is necessary to lift the nose a bit and pull back on the power or it will not land. Stall clean is 38 knots and with flaperons it drops to

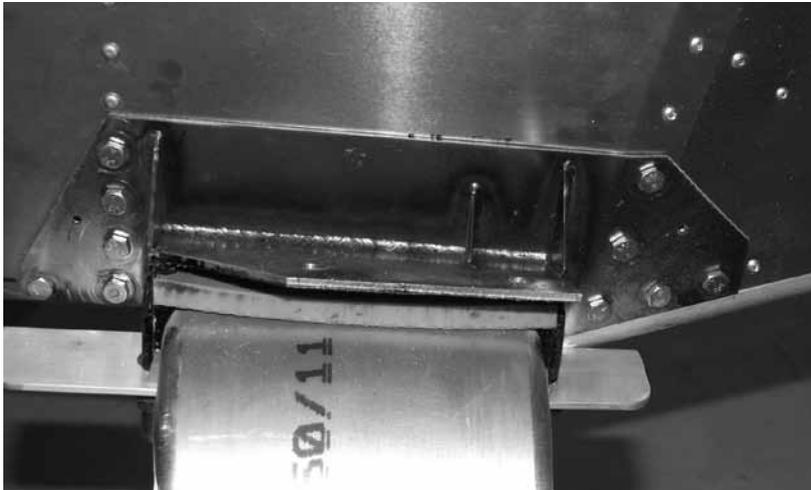
32, so landing speeds could be slower as long as the pilot maintains some power to moderate the sink rate.

Stick forces are balanced and light but not oversensitive. The rudder is effective and there is plenty of authority for a sideslip. When flying solo Angus finds that the left wing is slightly heavy, not unusual for a side by side plane, but very little right stick will counter this. The CH 750 follows its nose well and the pilot can almost ignore rudder except for crosswind landings. The handling of the plane is responsive and it is a lot of fun to fly. The stall is a non-event except that the sink rate increases markedly, but the flaperons give good roll control even in the stall.

The stock wing tanks carry 12 gallons per side but Angus chose the optional 15 gallon units, and with the Jabiru his range is 5.5 hours plus reserve, over 400 nautical miles. Angus and his wife plan to use their new plane for local trips and cross countries. The Ottawa area is dotted with rural strips and bodies of water so a set of floats are planned for the future. The CH 750 is the perfect plane for exploring and camping off the beaten path.

RCA

For more information: Zenith's website: www.zenithair.com. The Canadian distributor is Can Zac Aviation www.canzacaviation.com



Top, left: This steel weldment holds the landing gear and takes the lift strut loads into the fuselage structure

Above: The nose gear is suspended by a bungee and steered by links from the rudder pedals

Left, the inverted airfoil stab produces downforce with less drag than a symmetrical airfoil

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