

Cessna's new stick-and-rudder aeroplane



Andrew Underwood checks out the newest shape in the skies

C172, C172, C172, C162 is how my logbook now reads.

After 250-odd hours in Cessna Skyhawks training for my CPL, I was given the opportunity to try out its new younger brother, the C162 SkyCatcher, for *Aviation News*.

The widely known and loved C172 is the bread and butter of most training organisations around the world, particularly at the large school where I've completed all my flying. However, seeing a new training airframe from Cessna is both exciting and intriguing for me as a student.

I rolled out to Ardmore to meet up with Nicola Evans, the demonstration pilot accompanying ZK-DNA, the first SkyCatcher to be imported to New Zealand through Flightline Aviation Ltd and now on line with the Auckland Aero Club.

The original SkyCatcher prototype, the first all-new Cessna light single design since the C177 Cardinal was started in 1965, first flew in 2006, although due to some setbacks during testing, the first delivery was delayed until December 2009. This particular airframe was fresh off the assembly line, having clocked only some 11 hours of demonstration flights.

The C162 will probably serve as a replacement for the 152 which ended its production run in 1985. Both share the familiar Cessna twin-seat, tricycle undercarriage, high-wing design, with pilot training as their primary usage. The older C150 had a similar Continental O-200 powered engine, with its replacement C152 having a 110hp Lycoming O-235.

However, the 162 has progressed considerably in technology, featuring a specially designed Garmin 300 avionics package, a new single-hand panel-mounted yoke and a bright LED landing light arrangement, all accompanied by a nice safe low stall and approach speed to fit within international light sport aircraft (LSA) regulations. These LSA rules include series factory production, a MTOW of just 600kg (1320lb) and a maximum stall speed of 45kt.

The LSA C162 can be flown with a recreational pilot's licence (RPL) with a medical based on the LTSA commercial driver's licence, and it can also legally be used for PPL and CPL hour building and testing, night flying, instructor ratings and biennial flight reviews.

This is a clever move on Cessna's part, tapping two potential buyer markets simultaneously: the flight school industry seeking to replace ageing fleets; and wealthier older pilots wanting to have their own aeroplanes and maybe leasing them to aero clubs or flying schools.

On paper it looks very appealing to both groups, with Cessna promotion emphasising how economical the SkyCatcher is to operate with its light weight and low fuel consumption.

How economical? The Auckland Aero Club has found that the C162 fuel consumption rate sits at an average of just 19l/hr on a typical training flight, compared to the 35l/hr of the C172 Skyhawk. This is a conservative value, with a full rich mixture being used while the engine is run in for its first 50hr. Some number crunching by the club's instructors show 16l/hr should be achievable, a figure expected to be proved through economy runs once the nationwide demonstration tour has been completed.

External appearance

I approached the SkyCatcher with no bias. I'm conscious that Cessna has a dominating presence in flight training world wide, but I'm equally aware that there are many alternative current

aircraft competing for the place that the C162 is seeking to claim in the aviation industry.

First impressions are everything, and I have to admit that visually, she's not the most appealing machine I've ever laid my eyes on. Due to the heavy carburetted engine up front, the forward centre of gravity arm is relatively short, resulting in a rather snub-nosed appearance. The straight line of the fuselage top leading from high up at the back of the main wing, right along to the base of the vertical stabiliser, looks unusual to me, as if the C162 is missing a steeply angled rear window section, although it does include a very gently angled sky light window above the luggage locker.

ZK-DNA lacks the optional wheel spats which, although offering a reduction of only 2kt at the price of saying goodbye to 10lb of useful load, certainly add visual streamlining overall, judging by photographs.

Auckland Aero Club president Rob George says it makes much more sense to have the wheels "naked" in a training environment as tyre pressure and condition can be easily inspected, along with the brake discs and connections. It also eliminates the chance of damage when operating from rough unpaved runway surfaces around the country at the price of having a little mud splashed up under the wings.

The high-wing monoplane design spans 30 feet and is a standard Cessna feature, although the aerofoil was thickened during production to aid the LSA low stall speed requirements. Each two-spar strutted wing has a slotted flap and an integral fuel tank.

The airframe is entirely of semi-monocoque sheet aluminium construction, bar the fibreglass cowling. Match hole drilling, where multiple panels of the same type are stacked, aligned and drilled together, was reportedly used during the C162 construction which has helped reduce cost. This has been a widely used process with kitset aircraft such as the Vans RV and it seems logical to implement this process at larger construction plants.

The wing struts attach to the fuselage behind the cabin doors, a first for Cessna's single-engine trainers. There are no little steps mounted anywhere on the airframe to aid refuelling or dipping the wing tanks. A ladder is required to reach these instead, but such are commonly found next to the pumps during cross-country flights to unfamiliar aerodromes.

Also noticeably different from its predecessors is the ventral fin. A larger surface area proved necessary to aid spin resistance after two aircraft were written off, unable to recover during aggressive spin testing at weights above MAUW and with C of G outside the recommended envelope.

A ballistic parachute system can be included as an optional factory extra for recovery from loss of control or failure of the aircraft structure. ZK-DNA lacks the parachute due to weight and cost penalty reasons.

With the wing struts behind the door openings, the cabin doors are hinged from the top, rather than the traditional front-hinged opening. There isn't any latch to open the actual window, which isn't favourable. The door can be opened to access some much needed extra fresh air while taxiing under warm and humid summer conditions.

The last new feature I observed before entering was the castoring nosewheel. Directional control during taxiing is provided through differential toe brakes on the mainwheels, allowing a nifty turning radius of just 38 feet.

The main landing gear uses tapered steel tubes for shock absorption, while the nose leg is a urethane spring connected to the engine mount. This was a big deal for Cessna, making sure the SkyCatcher could withstand the hard landings always associated with beginner students.

Everything else on the SkyCatcher seems pretty conventional and easily repairable. Pitch trim is provided by a single trim tab on the right-hand elevator, and a small pop-up panel on the port side of the front cowl allows access to the oil dipstick. Air intakes either side of the spinner provide cooling to the four-cylinder Teledyne Continental O-200D engine, with a smaller centrally positioned carburettor air intake below it.

Cessna and Continental have a long-standing relationship, although rival engine manufacturer Lycoming and Cessna are both Textron companies. As the O-200D is a horizontally opposed, four-cylinder, naturally aspirated engine, mechanics worldwide will have no trouble servicing or repairing it. It will also benefit students by teaching them how to operate with carburettor heat. Unless they are stepping straight into an airline seat they will more than likely progress onto a less modern aircraft in future commercial flying jobs.

This latest O-200D variant has a new light-weight crankshaft, cylinder design, starter and camshaft, adding up to an apparent reduction of around 24lb to bring the dry weight down to 199lb. The propeller is a McCauley two-blade, fixed-pitch forged aluminium alloy piece of 67in diameter, nice and basic for student pilots. A lighter weight composite alternative is available as an optional extra.

Interior design

My next initial impression came on peering inside the cabin: very minimalist compared to other Cessnas, but also very spacious.

In fact the SkyCatcher broadens to a roomy 43.6 inches at shoulder height, much wider than both the C152 and C172R and even wider than the mighty Stationair's cabin of 42.5 inches.

However, the dark grey paint scheme and lack of trim give the interior a rather industrial appearance. Parts of the elevator and rudder cables are clearly visible running along the edge of the windscreen, down by the pilot's feet and above the luggage locker. It doesn't exactly evoke the sense of safety or groundbreaking modern technology that Cessna is promoting, but it's all a matter of saving weight in an LSA.

Fuel quantity is indicated by sight gauges in each wing root, utilising floating balls for visual indication and placards to indicate the difference between level flight and on-ground attitude, familiar to any Piper Super Cub pilot. The fuel selector is On or Off, with no provision for using individual tanks.

Unusual these days is the large manual flap lever on the floor between the two seats, like a car handbrake. Not having an electric flap motor system reduces weight while adding only a very minor pilot workload. However, when flaps are fully lowered and the flap lever is raised to its highest setting, it gets in the way of the arm's path to the throttle and takes some getting used to.

What stands out most of all is the brand-new single-handgrip stick that replaces the two-handed control wheel typical of every other postwar single-engine Cessna except the Bird Dog. At first glance it looks like a joystick from a Flight Simulator game, riding on a moveable arm extending out from beneath the panel. Cessna test pilot



Not hiding the plumbing behind cabin trim at least allows easy inspection of components, and the fuel sight gauges are the simplest and most accurate possible. The stall warning horn is — a horn.



Auckland Aero Club president Rob George (right) introduces John McLean to the latest addition to the club's fleet.



"The dark grey paint scheme and lack of trim give the interior a rather industrial appearance" with no attempt to hide the workings. The control sticks are a real departure from normal Cessna practice.

Dale Bleakney nicknamed the device a 'stoke', being a hybrid between a stick and a yoke.

It looks as though it was Cessna's idea to try to replicate the angular movement of a floor mounted control stick, without actually planting it through the floor frame between the pilot's legs, thus allowing more room and personal comfort in the cabin.

However, when I first sat in the cockpit and moved the control stick through its axes, the linkage felt strange and unnatural. My brain was so used to the simple linear in and out for elevator and left and right twist movement for aileron control that I couldn't process what was happening to start with. Nicola said other pilots had had the same issue and assured me that once airborne, it made much more sense and worked very well. Pilots used to sticks had no problems.

Instead of adjustable seats, the SkyCatcher has adjustable rudder pedal travel. This keeps the pilot's body in a constant position, with the desirable 1/3 spot for VFR flying on the windscreen at a constant distance from the pilot's head.

The baggage compartment behind the two seats, that fold forwards for access, is capable of holding a maximum of 50lb. Tie-down rings and a net are supplied to secure the baggage, and covering the aft opening to prevent any loose objects sliding into the tail cone is a lightweight fabric cover.

At the centre of the dark grey instrument panel are the various switches, circuit breakers, radio and transponder. Running through checklists in this aeroplane will be simple and easy to remember, with much less clutter than other Cessna panels and a general appearance less intimidating for new pilots learning to fly.

The instrument panel is definitely the most noticeable technological advance in the whole aeroplane. Garmin has created a single 7in high-definition portrait orientated WGA display screen in the form of a primary flight display (PFD) for the left-hand side of the panel. A multi-function display on the right-hand side is an optional extra which ZK-DNA does not feature.

The main PFD, the G300, is essentially a watered-down version of the more familiar G1000. It can operate as a split screen with the engine instruments, ASI, VSI, altimeter, artificial horizon, directional indicator and turn coordinator all arranged on the top half, with a moving map fed by GPS displayed below. It offers dozens of combinations of the two and it's up to pilot preference as to how the screen is arranged.

Pilots with experience on both the G1000 and G300 quote the latter as having a capability of around 80 percent of the G1000. Both an A320 pilot and a 70-year PPL holder were impressed at how easy its functions were to learn and how much information was provided.

ZK-DNA comes with the optional external power receptacle so that pilots can train on how to

use a glass cockpit without running the engine or depleting the battery. Features that I was surprised to find included weight-and-balance calculation software and synthetic vision technology (an optional extra) loaded with the Australasian terrain database. This basically displays a colour coded 3D topography outline showing what is below and in front of the aircraft.

The lack of mechanical gyro instruments eliminates a lot of associated failures, reduces weight and displays instrument increments on an unparallelled level of accuracy.

However, having learned to fly on these steam gauges with their analogue displays, I've always found flying with the newer linear tape information readout of the Garmin display face challenging and hard to get used to. Not only do your eyes have to adjust from seeing needles in easy to spot positions, but the large shiny screens and very precise altitude, speed and heading readouts are also more distracting and critical. Losing, say, 25ft in a medium turn wouldn't be noticed as much in an analogue aeroplane as it is with a Garmin readout of 2525 exactly on the altimeter.

In the long term it may benefit students to fly much more accurately, but it may also subtly encourage them to have their eyes inside the cockpit rather than outside (the whole premise of VFR flying) checking for constant confirmation. And unless you're graduating flight school and heading straight into a commercial airliner with a similar setup, I have been told by certain instructors that it's a waste of time and you're more likely to get a job flying a clapped-out old analogue aircraft.

Nor does the SkyCatcher come with a single backup analogue instrument in the event of electrical failure. The Auckland Aero Club will be including a simulated electrical failure whereby pilots will need to fly a circuit and land with the G300 turned off before they are signed off for their type rating.

Also missing from the interior of the SkyCatcher is a direct reading compass. Magnetic heading information is instead provided through a magnetometer inside the tail cone, with information relayed to the G300 interface. Flightline Aviation says Cessna is due to release an additional compass option in August, which will be added to ZK-DNA for the purpose of compass turns which are still part of New Zealand flight tests.

Performance

With a lighter, cheaper aeroplane than your bog standard C172, there are going to be some understandable performance differences.

The C162's flight manual gives a takeoff distance of 347m to clear a 50ft obstacle, sea level, ISA and zero wind, against that of the old C152 at 408m or a C172R's 514m. That's an impressive

figure and will allow flexibility with the number of airstrips it can visit around the country.

Landing distance under the same conditions is actually longer at 417m, which surprised me as it's longer than both the C152 and C172, both significantly less than their takeoff distances. I assume this longer roll is the result of a final approach speed of around 60kt, only 5kt slower than a C172, and the fact that the thick lift inducing chord of the SkyCatcher wing makes the flare last longer.

Despite its nickname 'Flycatcher', its maximum speed at sea level of 118kt compares with the C152's 110kt and the C172R's 123kt to show there isn't too much of a spread among the Cessna family.

But the C162's power-to-weight ratio allows it to get places quickly, with a rate of climb of 880ft/min from sea level. Realistically, it can achieve an average of 105kt on the ASI, whereas Auckland Aero Club's C152 cruises at about 90kt.

However, its light weight limitation has some downsides too, among them the size of the fuel tanks. The C162's usable fuel capacity is only 90.8lt which will limit its range and frequency at which it will need to be refuelled.

After reading the C162 Pilot Operating Handbook, I was convinced that the LSA category's MTOW cap of 600kg was definitely the SkyCatcher's Achilles heel. I was wrong.

The C162 has a MTOW of 1320lb (598.7kg), and its standard empty weight is 834lb, leaving a useful load of just 490lb (222.3kg). When you minus two times the CAA standard passenger weights of 190lb, that leaves only 110lb. A full tank of gas (including unusable fuel and oil) weighs 153lb.

This did seem like a range limiting problem until I found that the C162 burns only just under 20l/hr, or 22l/hr to be safe. With two standard weight pilots on board, that still allows for 3hr 9min solid flying time, or 2hr 39min with legal daylight reserves.

It should be noted that the above empty weight does not include the fire extinguisher, ELT, wheel pants, engine primer, flight bags or AIP volumes, any luggage or other optional extras. But then again, not every person wanting to fly weighs as much as 190lb. It's all swings and roundabouts.

ZK-DNA actually has a useful load of 445lb, a reduced weight due to a number of additional features installed. On the day of the flight with Nicola, we had a combined weight of 300lb which allowed for very close to full tanks.

In flight

The early-morning preflight inspection was performed at an Auckland Aero Club member's private hangar. As well as following Nicola around, learning about the aircraft's features, I quizzed her on dozens of questions which she helpfully answered.

Start-up was similar to a glass cockpit 172, testing the avionic cooling fans before checking the weather on the radio with the masters on. The sky conditions were clear over the aerodrome, with a very light south-westerly wind only a few degrees off runway centreline. The 2000ft wind was only 11kt today, down from 47kt earlier in the week.

No priming was required for start-up, and the engine turned over easily. I was a little timid to begin with, taxiing a castoring type aeroplane for the first time. Nicola advised that the rudder pedals were rather stiff, with an easily accessible spring coil controlling the pedal resistance due to be loosened in the near future.

Pre-takeoff checks were simple and logical, checking the oil temperatures and pressures and making sure no red Xs appeared on the Garmin screen. After a minute or so in the 10deg temperature the engine began to run rough, but that was quickly remedied with an application of carb heat.

The circuit was clear as we lined up with 10deg of flap selected. I made a rolling call, edged the throttle forward and the little SkyCatcher got airborne itself without any back pressure required, lifting off gently at around 45kt.

The best rate of climb (V_x) for the C162 is 62kt. However, being unsure of what that attitude looked like relative to the SkyCatcher panel, I ended up climbing us at closer to 75kt. Still, I was surprised at how quickly we rose, registering 1000ft/min on the VSI. The O-200D engine is only 60hp less than the C172's IO-360-L2A, while the SkyCatcher weight is only half that of a Skyhawk. It was very impressive!

Climbing through 500ft AGL, I started to make my turn left towards the crosswind leg of the circuit. Being stuck in the C172 mindset, I tried to roll the control stick rather than slide it and immediately met with a firm resistance. The new design of the single stick control allows for very slight angular movement left and right, but it is

meant to be slid left to right rather than actually turned, just like the true floor-mounted control column found in a Citabria or Cub, for example.

It took me a good few seconds to figure out what I was doing wrong, getting quite flustered with myself and ended up rolling a messy 1200-and-something feet in the downwind, when I really should have been sitting bang on 1100ft.

Once straight and level again, I let the airspeed pass through 100kt, then reduced power to 2550rpm, a slightly higher setting than recommended in the flight manual but being used for the first 50hr while the brand new engine is being worn in.

I tracked out towards Hunua VRP, about 7nm south-east of Ardmore and the prearranged meeting point to formate with ZK-ISS. Flightline/Skysales had kindly provided its brand new Robinson R66 turbine powered helicopter as a camera ship for some air-to-air photography. A briefing with the photographers and chopper pilot earlier that morning ran through hand signals, positioning plans and all the other things involved with such an exercise.

Nicola took control, reducing our airspeed to 90kt, a safe speed for ISS without its doors on, and we flew gentle orbits around the Hunua Ranges at 2000ft for half an hour or so.

The camera ship eventually peeled away and I was given control again, heading back towards the Hunua valley training area with the low-lying land around the coast swathed in fog. It felt good to properly get the hang of using the new control stick and witness how nimble and reactive the SkyCatcher was to fly.

Once away from NZAA's CTA airspace, I climbed up to 3000ft, using V_x (best angle of climb, 57kt). It seemed very nose high in comparison to the angle needed to achieve the same speed in the C172, but we gained altitude quickly.

A medium turn to the left was remarkably easy, with the large windscreen providing ample visibility over the nose and the horizon easy to track. The stiff rudder pedals required a little more input the C172's, but apart from that there were no dramas.

A steep turn right was pleasantly achievable. Again, the big windscreen created no problems and setting a 45deg angle of bank relative to the top of the panel was painless. Peripheral vision out the side windows was also greatly improved from the C172, which I liked.

After a few more manoeuvring turns to stay within the valley confines, I deliberately tried turning the aircraft out of balance by removing my feet from the rudder pedals and just rolling the ailerons. I slowly banked in from the left and then snapped it back to the right, resulting in adverse yaw shooting the nose way off to the left.

This effect was dramatically more noticeable than when the same manoeuvre is performed in the C172 and will definitely defer any future students from picking up the bad habit of turning out of balance.

The brand new engine needed a good 50hr worth of running in before the power could be chopped about quickly for stalls and slow flight. However, with the help of the electric trim on the top of the stick I managed to bring the airspeed down to within flap operating speeds — 100kt for the first 10deg, then 85kt for 25deg and 70kt for full flap (not indicated, but looking somewhere between 35deg and 40deg). In this configuration there was still plenty of airflow over the horizontal stabiliser and rudder surfaces for adequate manoeuvring without much effort.

By this stage we were up at 3500ft and with smooth air conditions I began a powered descent back towards the aerodrome. Pointing the nose down, the SkyCatcher achieved over 126kt in the yellow range of the ASI at around 2600rpm, descending at 1000ft/min.

I levelled off at 1600ft for a standard overhead rejoin. Nicola suggested I try advancing the throttle to its red line to see what the aircraft was capable of in a straight line — it held a steady 115kt, the same speed we plan our C172 cross-country flights.

Running through BUMFH checks in the downwind, I was number one to land. Nicola talked me through power reduction for a 70kt base as I lowered the flaps in stages.

It turned out that I'd carried a little too much power into and on final and couldn't wrestle the speed down from 70kt to the recommended 60. Instead of sidestepping, I called a go-around and we climbed back up to circuit altitude rather smartly for a second attempt.

Back on a left base approach for runway 21, I made a mental note of being much more conservative with the throttle this time around. With only light and variable winds on the ground, I crossed the threshold at about 55kt and touched down right on the centreline with a tidy little flare.

After making a nice tight 180deg turn, we vacated the runway and I retracted the flaps while



Nicola flicked off the lights and transponder. To see just how effective the differential braking really was, I spun the SkyCatcher 360deg round to the left, holding on the left brake and using a slight increase in power. The left wheel was not travelling forwards at all, and we turned right on a dime.

I had a big smile on my face for the rest of the day. The SkyCatcher is a really fun aeroplane to fly, and three other local pilots who have logged time in ZK-DNA all agree. The lag between control inputs I'm used to in the C172 didn't seem as apparent in the C162. It felt very hands-on with clear to see and feel reactions to my control inputs. I believe for this reason alone it will become a popular trainer world wide.

Having said that, I believe there are three more main reasons the SkyCatcher will be an industry winner.

- Low capital investment: \$180,000 will get you a ready-to-fly C162 with all the importing, certification and registration organised by the Cessna distributor, Flightline Aviation Ltd. A new C172 will cost double this, or tens of thousands more for an equivalent new Tecnam.

- Low operational cost: travelling close to the speed of a C172 for just a 22l/hr fuel burn.

- Cheap to repair: no composite materials to source thanks to the aluminium construction so skin damage can be rectified with ease. The Continental O-200D is reliable, widely understood and can be easily serviced. Less time spent in maintenance equals more revenue for the operator.

Above all else, though, it's a simple aeroplane — simple by design, simple technically and simple to fly. This factor alone will appeal to just about anyone wanting to either learn to fly or own their own flying machine.

The only criticism I can think of — and I've tried hard to come up with more — is how noisy the C162 was inside the cabin. This is due to the lack of interior panelling and trim, which would usually keep the vibrations and noise out and isn't included to keep both price and weight down to a minimum.

It's not a giant issue, as headset and radio volumes can be manually adjusted, as I did during my test flight with ZK-DNA. It may become more tedious on longer duration flights, particularly cross-country. However, you get what you pay for, and this is an understandable compromise.

The jury is still out on whether or not the SkyCatcher will become a major commercial success. It's definitely the New Zealand aviation scene's mentality to sit back and watch other countries buy, test and prove new aircraft designs before committing to larger quantity purchases here.

After ZK-DNA's nationwide demonstration tour there may be a few more names on the booking sheets, but for now Chris Barry at Flightline has confirmed a further three C162s are expected to be delivered in New Zealand during the first quarter of 2012.

The Auckland Aero Club hopes to have ZK-DNA on line for members of the public to hire out as of September this year, with a solo hourly rate of under \$200 for club members. This is an excellent rate, bearing in mind student loans to trainee pilots have recently been cut to not include solo hour building.

I expect ZK-DNA will become an ever-popular machine to see out at Ardmore over the next few months, and I'd definitely recommend other readers to experience flight in the SkyCatcher. *A big thanks to John King and Aviation News for the opportunity. Chris Barry from Flightline/Skysales for supplying the aircraft. Nicola Evans for her instruction and guidance and AAC president Rob George for organising us all together.*