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LEGEND CUB

Satisfying to manoeuvre and an excellent training tool – this replica Cub is flying after an 18-month build from a kit created by the American Legend Aircraft Company of Texas – purrfect for a quiet summer evening over the English countryside

Words Francis Donaldson

Photos Ed Hicks

Dave's normally grinning face clouded over as he handed me the keys to the spotless high-winger, which had made its first flight less than a week previously. "You have flown Cubs before, haven't you?"

Nodding some kind of encouraging reply, I climbed aboard and made ready for flight. Dave's query wouldn't go away though, and I began to wonder – was there something about this innocuous looking aeroplane he wanted to warn me about, or was he worried I might be over-critical in my review. Alternatively, was he just concerned perhaps that this newest among the homebuilt projects he has overseen might contain some as yet undiscovered flaw?

The scene was idyllic – a pristine Cub sitting on a grass airfield under the low-slanting summer's evening sun, with a 10kt wind blowing nicely up Turweston's tussocky cross-runway. True, my experience of Cubs was limited to a couple of flights separated by more than 20 years in my logbook. And true, this was a just-completed aeroplane, but on the other hand its pedigree was immaculate, its specification simple and it had been lovingly crafted under the closest scrutiny, so all the omens were good.

A BIT OF HISTORY

When Piper Aircraft Corporation introduced its high-wing J3 Cub tandem two-seater 75 years ago, there was little about it to make you imagine that the design would still be popular into the next century and even considered by many to be a classic of its type. A textbook case of the right product being available at the right time, the J3 model with Continental A65 engine was introduced in 1937, and production ceased in 1947, astonishingly some 19,000 aircraft later. The majority were built for military service either as trainers or as observation and liaison

aircraft as the L4 model, which saw widespread service both in WWII and in Korea.

The J3 evolved into the post-war PA-11 Cub Special, boasting more sophisticated enclosed cowlings and wing-mounted fuel tanks, which allowed the PA-11 to be flown solo from the front seat. The PA-11 was but an interim step to the better-known PA-18 Super Cub that Piper introduced in 1949. The Super Cub introduced flaps and twin wing-tanks, a stronger structure to carry heavier payloads and a range of more powerful engines up to the 150hp Lycoming O-320, although many super-STOL conversions use the 180hp O-360 engine. The Super Cub's production ran to over 9,000 aircraft built over a period of almost 40 years.

But the story goes back further than 1937, for the design originated in 1930 as the Taylor E2 Cub, which was a very basic, open-cockpit, high-wing aircraft with square-cut wing and tail surfaces, powered by a 40hp engine, and intended to be a bare minimum approach to getting two people in the air. Designed by C G Taylor and built by the Taylor Aircraft Co in Bradford, Pennsylvania, the E2 model created little interest and the Taylor company lasted less than a year. Fortunately, the marque was rescued by local entrepreneur Bill Piper who created Piper Aircraft Corp to continue development, keeping Taylor on as President of the new company.

The Taylor Cub sold in small numbers, but never made it big. According to legend, success only came after Taylor took some time off, leaving his Chief Designer Walter Jamouneau to his own devices. Egged on by Piper, in Taylor's absence Jamouneau tweaked the Cub design by rounding off the surfaces, glazing the cabin and generally tidying up the appearance, resulting in the 40hp Continental A40-powered J2 model Cub. The story goes that on his return, Taylor was so angered by the cost of Jamouneau's improvements to the bare bones E2 that his Chief Designer was fired on the spot. He was soon back in his drawing office, though, as the sales for the J2 model picked up and soon outsold those of its angular forebear. Then Continental came up with the overhead valve A50 engine, which with ten extra horsepower gave the J2 Cub a welcome improvement in performance over the side-valve A40, and with a slightly higher compression ratio the A50 soon begat the definitive 65hp A65. After a fire destroyed the Bradford factory, Piper set up a new facility at Lock Haven and further improved on the J2 as the J3 with a steerable tailwheel and wheel brakes, adding cute half-round side windows. A number of different engines were tried, but mating the J3 airframe with the Continental A65 engine produced the quintessential J3C-65 Cub.

First appearing in 1937, this version came out just as the American military were setting up the CPT flight training schools all over America to train pilots for the coming conflict, and of all the light aeroplane producers of the time, Piper benefited most with thousands of orders for J3C Cubs as trainers and of the L4 spotter version with extended rear glazing to the cabin. It was these military contracts that turned Piper from a hand-to-mouth operation to a major producer; at one time Cubs popped off the production line at a rate of one every 20 minutes.

Ironically, Cub designer Taylor fell out with boss Bill Piper just before the J3 hit the big time, and went on to develop his own line of better-performing side-by-side Taylorcrafts, which were to continue in production in one form or another until the late 1990s. The Taylorcraft also became the starting point for the UK Auster series.

LAA OWNERS' CHOICE

The J3 Cub has always been popular among LAA members, thanks to its simple structure, friendly handling characteristics and STOL performance making it the ideal farm strip aircraft. The LAA fleet boasts some 90 J3s and 30 PA-18s (the latter branded as the ex-military L-18C), largely thanks to the efforts of a few individuals who scoured France in the 60s and 70s and brought home many tired ex-military examples which, gifted to the French flying clubs after WWII, had fallen from use as their engines became time-expired or a new fabric job was due, and could be picked up for a song. Thanks to the LAA (at that time PFA) system, these aircraft could be economically restored and have since enjoyed a new lease of life in private ownership.

Nowadays, due to European harmonisation, we no longer have the option of transferring a genuine J3 or L-18C to an LAA Permit, as any more examples coming onto the UK Register currently have to qualify for a Certificate of Airworthiness. Such is the appeal of the Cub that second-hand Cubs on a Permit to Fly are in strong demand and command much higher prices than their less-well-known contemporaries such as the equivalent Aeroncas, Taylorcrafts and Austers.

These days, would-be Cub owners have another route to owning a classic J3. For more than 20 years Wag-Aero of Lyons, Wisconsin, has made available a plethora of Cub lookalikes in kit form. Depending what takes your fancy, Wag-Aero kits allow you to put together a dead-ringer of a standard J3, a high-powered clip-wing special, a camouflaged military L4 Grasshopper with greenhouse cockpit or a big-wheeled and flapped STOL bushplane. Despite the host of mouthwatering options to choose from, Wag-Aero's kits have never taken off in a big way in the UK, perhaps because builders found the very number of models available made the drawings and manuals very... shall we say, difficult to interpret and open to question. One UK builder went so far as to re-draw his wings from scratch before he dared start assembling them, finding that the as-supplied drawings left a lot to be desired.

AMERICAN LEGEND

This month's offering is a more recent latter-day Cub replica kit, the Legend Cub from American Legend Aircraft Company of Texas. The Legend Cub standardises on a simple build formula, which results in an aircraft that is externally difficult to tell apart from a Lockhaven-built Cub, yet includes features that subtly improve on the 1937 design. The review aircraft, G-CGXN, has been built by well-known LAA inspector and multi-time builder Dave Silsbury and local LAAer Fred Rogers at Saltash in Cornwall, and first flew in May this year after 18 months under construction.

Dave and Fred have certainly made a beautiful job of it. Gleaming in its classic Cub yellow scheme, complete with carefully copied black side-flashes, the aircraft looks every bit a J3. Dave and Fred are so pleased with the standard of the kit that they have taken on the UK agency for the type and hope to help bring similar brand-new Cubs to other LAAers.

So what's different about Legend's Cub? Coming up close, you find the fuselage is three inches wider in the cockpit, giving a welcome bonus in elbow room, and making the rear bench seat look almost wide enough for two, so some have confused the aircraft with Piper's three-seat J5.

There are also doors on both sides of the cockpit, rather than on the right side only. Like on the original J3, the doors are horizontally split so that the lower half flops down to open, while the upper (glazed) part flaps up and clips to the lower surface of the wing. The presence of the left-hand door means that the engine controls have to be relocated to a more forward location on the cockpit sidewall.

Whereas the classic J3 sites a single 10g fuel tank in the forward fuselage, crammed up against the firewall, the Legend Cub uses welded aluminium alloy tanks in each wing-root. This increases the fuel capacity to a more useful 17 gallons, and according to conventional wisdom, keeping tanks outside the cockpit lessens the fire risk in a crash. Significantly, this configuration means that whereas the J3 Cub is flown solo from the rear seat, in the Legend Cub the pilot sits up front and the passenger, when carried, takes the rear seat, as on the PA-11 and PA-18. This of course gives the pilot a much better view out and puts the instrument panel within easy reach. A sight gauge in each wing-root displays the fuel level.

The Super Cub, which also uses wing tanks, has a pair of header tanks to ensure that the last drop of fuel can be taken from each tank in turn, irrespective of crazy sideslips or other manoeuvres that may tend to let air into the fuel lines. The Legend Cub seems to manage without header tanks, instead feeding the fuel from both tanks simultaneously, which seems to keep the fuel flowing steadily, and certainly simplifies the system.

On the safety side, unlike the J3, the Legend Cub includes a full shoulder-harness for both crew as standard, the pilot's shoulder straps dropping down from the roof level to pass over his shoulders rather than, as you'll see retrofitted on some J3s, attaching to the seat base and routed ineffectively up the back of the pilot's seat back. Behind the canvas-sling-type rear seat there's a baggage space contained within a tough, cloth recess. Up above, the Legend Cub sports a fabric headliner, the fitting of which was, according to Dave, the only really tricky part of the build – it's one of those times when you can only establish where to cut the headliner by trial and error, you can't get the headliner into final position until the edges are trimmed but if you cut too much away by mistake you can't put material back, so each trial has to be by a series of very small snips.

Up front, the Legend Cub sports the familiar gold-painted Continental four-cylinder engine, looking at first glance exactly like all those thousands of A65s, C85s and others that have graced the J3 these last 75 years. Remove the cowlings, however, and you find that it's one of the brand new 100hp O-200D engines, which Continental has recently certified. The 'D' model is recognisable by its differently-shaped, more angular oil tank which hangs beneath the crankcase, a much more effective spin-on full flow oil filter, replacing the traditional tea strainer variety, and a lightweight scalloped propeller-driving flange. Paradoxically, this latter means you have to have a cylindrical adaptor to match it to a wooden propeller like the Sensenich fitted to 'XN, otherwise the

smaller-area flange would imprint itself into the propeller hub when you tightened the prop bolts.

STEEL & FABRIC

Like later marks of J3, the Legend Cub has almost no wood in its airframe. The fuselage, tail and bungee-sprung undercarriage are of fabric-covered, welded steel tube construction, albeit for extra strength the fuselage is of 4130N chrome-molybdenum steel rather than 1025 mild steel as used originally by Piper. The wings are built around extruded aluminium alloy beaded I-section spars, like those used by Piper on countless Super Cubs, Tri-Pacers and Pawnees. The ribs are of sheet aluminium, while the compression ribs and drag/anti-drag diagonals form a bolted truss of square-section aluminium alloy tube. The wing leading-edges are sheathed in thin sheet aluminium, the whole lot then being fabric covered in Ceconite 102 fabric. The finish on 'XN is Air-Tech Coatings' system that relies on the polyurethane primer rather than dope for the build-up coats, and certainly yields very good-looking results. As failure of the dope film is the most common cause of paint ageing problems such as cracking and peeling, it will be interesting to see how the polyurethane-based system stands up in the long term.

While Cub aficionados will recognise that the Legend Cub's control system in the cockpit is slightly differently manufactured to that on the J3, taking advantage of modern CNC machining to eliminate some of the original's welding, the modern replica preserves the quaint external aileron control cables which route up the back of the front wing struts, and aileron pulleys suspended below the wing surface to deflect the cable run back to the horns on the respective ailerons. The elevators and rudder are similarly cable-operated, albeit these are hidden from view inside the fuselage in conventional fashion.

The pitch trimmer is cable operated, the cable running around a drum in the rear fuselage, which spins a jackscrew through a sheave, which in turn raises and lowers the leading-edge of the tailplane, altering its incidence. A tailplane trim position indicator, situated in the port wing-root, shows the pilot where in its travel the tailplane has got.

Flaps? Like the original J3, the Legend Cub has none.

PLENTY OF ROOM

Entry into the Cub needs a bit of a knack, and my unpractised efforts brought ribald comments from Dave. My way is to sit on the seat and then bring each leg in one at a time, which at least ensures that you don't fall over in the process. More practised Cubbists can apparently thrust a leg in, grab the tubing in the roof to take their weight and step aboard as effortlessly as they might put on their favourite pair of trousers. Either way, once aboard there's plenty of room and the three-inch-wider fuselage contributes to the feeling of spaciousness. The repositioned throttle is still in easy reach and seems natural to operate, although I would prefer a more substantial hand-grip on the throttle lever, if only to provide a tactile distinguishing feature from the adjacent carb heat control. The four-point harness fits well and shows no great tendency to slip off your shoulders.

Dave and Fred have fitted a classical set of gauges, though there's nothing to stop builders fitting a glass panel or two if they should choose to desecrate its vintage appearance in that way. One concession to modernity is the combined start/magneto key switch, rather than separate mag switch and push-button start. In any case, it feels strange to have the luxury of electric start in a yellow Cub, rather than having to hand-swing it. Like all good four-cylinder Continentals, the factory-fresh O-200D started on the first compression and burbled happily away, its cylinders clearly visible under their cooling air scoops.

Beautifully turned-out cockpit. Note forward location of throttle/mixture due to additional door on LHS

Taxying the Legend Cub presents few difficulties as the tandem seat configuration gives a reasonable view of where you're going, looking either side of the engine in turn. The combination of steerable tailwheel, linked to the rudder via a short pair of chains and tension springs, and differential heel-brakes give perfectly adequate directional control, and the Cleveland hydraulic disc brakes certainly inspires more confidence than the bladder type drum units originally used. The 8.00 x 6 balloon tyres on the Legend Cub, plus the bungee suspension coped well with the rough ground as we made our way carefully to the threshold of Turweston's rarely-used 03.

LEVITATION

Fully opening the throttle, the elevator and rudder came alive almost instantly and with tail well up the Legend Cub accelerated buoyantly into the breeze, the Sensenich holding the O-200D to a civilised 2,500rpm, and we hopped off the ground in less than 50yd with just the slightest of backward squeezes on the stick, at just under 40mph indicated. At solo weight, the stopwatch indicated a 700fpm rate of climb over the first 2,000ft of altitude, which at just 60mph represented a very healthy climb angle, the Cub seemingly levitating under the influence of those broad 35ft flat-bottomed wings.

Levelled off, gentle applications of aileron reminded that the Cub pilot needs to use his feet, for those wide span ailerons generate strong adverse yaw. Not sufficient to cause embarrassment though, and after a few seconds getting the hang of it the combination of directional stability, adverse yaw effect, rudder and aileron authority make the Cub a satisfying aeroplane to manoeuvre and an excellent training tool. In pitch, the Legend Cub shows strong longitudinal static stability at this rather forward C of G position.

At first, the Cub's controls seem on the heavy side but flown with panache, the Cub responds quite willingly, and that big wing certainly yields a small turn radius so the aeroplane can be manoeuvred in a small space. As an airshow aircraft, in the hands of old pros like Duane Cole, modified Cubs have performed almost every trick in the book (including, would you believe, the inverted ribbon cut) and you can still see car-top landings and similar antics being performed in a Cub in this country by Brendan O'Brien and his flying circus. Flying a Cub again, my respect for these pilots grows, for the Cub's controls and low wing-loading making it react to every passing gust make it hardly seem to lend itself to super-precise flying.

GENTLE CUB

Looking at the stall, the Cub has textbook behaviour. Wings level and power off, there's a slight natural buffet warning that comes in at around 40mph indicated, and a strong rearward stick force needed to slow her further. With an effort, the nose drops through gently at 38mph, without the slightest tendency for either wing to drop. Aileron inputs at the stall have no effect, and only with the additional yaw generated by a determined rudder input before the break can we get the gentle Cub to bite back with an incipient spin, instantly nailed as the controls are relaxed.

In the cruise, the Legend Cub is no speedster, despite the extra 35hp of the O-200D compared to the old A65. Full throttle eventually yields 100mph at 2,600rpm, but the Legend Cub feels most in her element bumbling along at 75 with the engine throttled back to an economical 2,150. At this speed she feels relaxed, friendly and quiet, and a lovely platform for watching the world go by beneath.

Time to land, and to enjoy the Cub's abilities in the sideslip, for with her moderate directional stability, effective rudder and generous side area the Cub comes down very nicely in a full-rudder slip, the wing tipped down and nose cleared away to show the airfield expanding ahead. Though not strictly necessary with the Legend Cub pilot, for his seat in the front yields a view ahead that's perfectly adequate in the approach in balanced flight, using a sideslip means you can carry more power down final, which is kinder

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EASY TO BUILD?

AS THE FIRST example of a Legend Cub to be built in the UK, inevitably the project needed greater LAA Engineering involvement than with an already-approved type.

After the initial exchange of a stack of paperwork between the manufacturers and LAA, much of it dealing with the differences between their kit and the original Cub, and satisfying us on the 51% rule issues, Dave and Fred imported their kit in October 2010. I visited their warehouse workshop at Saltash, just the other side of the Tamar Bridge, in early October where the kit contents were laid out for inspection.

I spent a few hours looking at the mouth-watering collection of neatly bagged-up parts and cardboard boxes containing literally everything needed to build the aircraft, from the factory-fresh Continental engine and gleaming Sensenich wood prop to the fully-welded steel tube fuselage and part-assembled wings. Also neatly bagged came a multitude of hardware, right down to the smallest nut and washer. This first trip was for a first look at the detail design, quality and completeness of the parts and to discuss the inspection schedule needed for the project.

Finding all seemed promising, a build number was allocated and the inspection schedule issued by LAA in November 2010. Construction forged ahead at a good pace and I made a second trip to see the work in progress in January 2011, at which point the majority of the airframe was trial-assembled. A number of minor tweaks were called for, the only one of any real significance being a revision to the design of the attachment for one of the wing drag/anti-drag diagonals. A number of schemes were considered and a new design of fitting was agreed by August 2011, when Dave and Fred got the go-ahead to finish the aircraft.

I next saw it in May 2012, by which time it was assembled and ready to fly. After a small number of further jobs were completed, I was able to hand over the flight test authorisation just in time for the aircraft to be test flown in readiness for its debut at AeroExpo at Sywell. The full Permit is being prepared just as this article is going to press.

on your cylinders (less shock cooling) and less vulnerable to carb ice.

Landing the Cub from the front seat is a real pleasure, with no shortage of forward view (as taildraggers go), the very low touchdown speed and a forgiving undercarriage. Even from a power-off approach at 55mph, she will float some distance before settling on three points, and the ground roll into any significant wind is only three or four fuselage lengths.

Unlike her English cousin, the Auster, the Cub is equally happy to be wheeled on, with seemingly all the time in the world to pin her on the ground with a little forward stick, after you feel the wheels touch. In a crosswind, of course, you're going to need plenty of into-wind aileron to keep the wind from getting under that high wing, but the slow touchdown speed means that with any reasonable bit of ground to land on you can angle across it to reduce your crosswind component.

So what do we love about the Cub?

It is slow, in fact with the original A65 motor it was 10 or 15mph slower than contemporary A65-powered aircraft such as the Aeronca Champ and Chief, Taylorcraft BC12D and Luscombe 8A. Defying aeronautical logic, even Piper's plump side-by-side seat version of the Cub, the J4 model, was a few mph faster than the relatively narrow-bodied tandem seat J3. The Cub is not as easy as some to get in and out of, and its tandem seating is less sociable than sitting alongside your passenger.

On the other hand, for those who love to drop in on friends on farm strips, or potter on a summer's evening with the door open, watching the countryside slide past 1,000ft below at 60 or 70mph, while knowing that the murmur from the well-silenced engine is hardly audible from the ground, the Cub remains second to none ■

OTHER CUB KITS

WAG-AERO SPORT TRAINER. Wag Aero originally supplied spare parts for factory-built Cubs, along with many other certified vintage aircraft, then introduced whole airframe kits in the 1970s. There are many variations available, but kits leave a fair bit to the imagination where details are concerned.
www.wagaero.com

CUBCRAFTERS CARBON CLUB. Cubcrafters have for many years supplied aftermarket STC'd mods for certified Cubs, but have recently released a Light Sport model of new manufacture, which they are also making available in kit form. The Carbon Cub uses a traditional Cub airframe but carbon mouldings are used for various items of secondary and tertiary structure with a view to reducing the weight and parts count, resulting in very good STOL performance when powered by a Lycoming O-320 engine of 150hp. The LAA is currently negotiating with Cubcrafters over the eligibility of the Carbon Cub for an LAA Permit to Fly, and we expect to see an example on these shores shortly.
www.cubcrafters.com

SAVAGE CUB. A Czech kit for a reduced-scale Cub lookalike powered by a Rotax 912-ULS engine. This kit has not been assessed by the LAA, but the very similar Rans S7S kit, which is LAA approved, is available through Skycraft Ltd.
www.zlinaero.com for Savage
www.sky-craft.co.uk for Rans S7

LEGEND CUB

Legend CUB

DETAILS

Top: wider rear seat and provision of two doors is evident from this shot. Note also roof-mounted upper torso restraints
Middle: main gear is conventional Cub but with Cleveland discs
Above: the stylish Legend motif

SPECIFICATIONS

PERFORMANCE
Max speed: 112mph (180kph)
Cruise speed (75%)**:** 100mph (161kph)
Stall speed: 38mph (61kph)
Take-off distance at SL: 310ft (94.4m)
Landing distance: 260ft (79.2m)
Rate of climb: 750fpm (3.81mps)
Service ceiling: 15,000ft (4,572m)

DIMENSIONS/WEIGHTS
Wing span: 35ft 6in (10.6m)
Length: 22ft 5in (6.8m)
Height: 6ft 7in (2m)
Wing Area: 129.4 sq.ft (12.02 sq.m)
Empty weight: 820lb (372kg)
Gross weight: 1,320lb (599kg)
Fuel capacity: 20usg (16.6 imp gal)
Engine: Continental O-200D

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