Motorglider or Microlight?

The Technoflug Piccolo b can be both!

Already in the 70es, the Swiss aircraft builder Albert Neukom at Schaffhausen (who died in 1983 in an aircraft accident and is well known by his successful “Elfe“ glider designs) designed a light wooden aircraft with pusher engine, the AN-20. Today we would call it a microlight, but still today flying microlights is banned in Switzerland (Just now there is a little hope – some microlights have been allowed to fly there for test purposes). So this AN-20 was certified as an “Experimental“ light aircraft, some were built from his plans in different variations. So also one with glassfibre wings and a Konig three cylinder radial engine. This version led to the design of the first all-glassfibre “Piccolo“ in Germany by Technoflug (who today also build the propellers for all the German retractable engine motorgliders and the Carat motorglider with Discus wings) at the Schramberg airfield (in the Black Forest, near Offenburg and Freudenstadt). This first Piccolo maiden flew in 1984. I had the opportunity to fly this prototype (D-KHAI) with an open canopy and a KFM engine with folding three blade propeller in 1985, and found her to be a nice, light and handy “fun flyer“ motorglider. Flight testing showed that the D-KHAI did just not fulfil the motorglider certification requirements, so some re-designing had to be done by the Technoflug leaders Rolf Schmid and Berthold Karrais. (This prototype has been sold to France not very long ago to have a “second life“ as a microlight!) Final result of the re-designing was the “Piccolo b“, which was type certified as a motorglider and put into serial production at Schramberg. Until today, 120 Piccolo b’s have been built. During the last years, changes in the microlight weight limits in many countries occurred, and it was found, that the “Piccolo b“ was now also certifiable in the 200 kg empty / 300 kg max. take-off single-seater microlight category without any changes. The microlight “Piccolo b“ was type certified in Germany in 1993. For those countries, where a parachute recovery system is mandatory, it can be fitted easily in the rear fuselage between engine and fuel tank, shooting out sideways. A crazy situation came up in Germany, where rescue systems have to be fitted in each microlight: The same aircraft must be flown with such a rescue system if certified as a microlight, but may not be flown with it when it is certified as a motorglider!

At Schramberg, Technoflug gave Me their factory demonstrator, the No. 119 (also exposed at the Friedrichshafen Aero ’99), which had been certified as a motorglider, for test flying. The Piccolo fits into a normal sized glider trailer. Rigging is easy and, with rigging aids, may even be done by a single person. The tailplane is pushed on at the rudder fin from the rear, with the elevator connecting automatically. It is held by three screws, which are automatically secured by spring loaded pins when they are screwed in completely. The wingroots are connected to the fuselage by two bolts each. The wing struts are always connected to the wing, the lower ends each are fixed to the fuselage with a bolt secured by a “Fokker-needle“. All the six bolts needed for rigging find their proper place in a holder in the cockpit when the aircraft is derigged. The aileron tube connections are made by L’Hotellier ball connections with safety pins, the spoiler cables are hooked in. The wingroot bolts need no extra safety needles: The rear ones become secured by the fuselage cover lid,

the front ones by the canopy frame against coming out. The fuselage cover lid itself is fixed by three snap-in screws, and additionally secured by the tank lid. The whole rigging procedure just takes some minutes, no heavy parts have to be lifted.

The little motorglider is equipped with a 13.3 meter rectangular, strutted GRP wing with the Wortmann profile FX 63-137. Both wings are being built in the same set of moulds with the root rib or wingtips either at one or the other end. This keeps costs low, but, of course, is not the aerodynamic optimum. The wingshell is GRP and foam sandwich, containing an GRP "I-spar". The upper surface has spring-loaded spoilers, the struts are steel tubes with an aerodynamic GRP cover. The fuselage is also completely GRP, with a steel frame connecting wing fittings and the robust GRP main undercarriage. The main undercarriage has two GRP covered braked 260x85mm wheels. The also GRP covered 210x65mm nosewheel is steerable, connected to the rudder, and well suspended. The Solo 2350 BS 23hp two stroke / two cylinder engine (as used as sustainer engine in some motorgliders) is fitted above the wings trailing edges, with a three-belt 2.1 :1 reduction drive to the pusher propeller above. The propeller itself is the Technoflug KS 118-3-2, with three-blades backwards folding by springs. A 12V/12AH lead battery serves for starting and instruments, it is charged by an 180 W generator. The 22.5 litre fuel tank, equipped with a fuel pump, is placed in the fuselage under the engine. A drain valve can be found close to the right wingstrut connection. The tail is equipped with a conventional rubber glider tailskid with steel plate, on which the Piccolo rests if the cockpit is not loaded. The big canopy opens backwards, being held up by a gas pressure spring. It allows easy entering into the roomy cockpit. The pilot has to lift his legs a bit higher, as the Piccolo is resting on the tailskid and nods on the nosewheel when the pilot enters the cockpit. The pedals are not adjustable, but the backrest can be positioned in three positions each at the bottom and the top, where it is held by a steel cable. The seating position is "half-upright" to "upright", depending on the backrest position. The rear side of the backrest is formed as a roomy GRP box, in which papers and some baggage can safely be stowed. At the rear wall, a headrest cushion is fixed, which is only useful in the rear backrest positions. There is enough space even for big or tall pilots, and also for a parachute. A pocket at the right cockpit wall, normally standard equipment in the Piccolo cockpit, was not yet fitted into this one. The controls are simple, but well placed, with airbrake lever, the throttle and the choke (for cold starting) at the left cockpit wall and the trim Ka-6e – like at the stick. The fuel cock is hidden below the right cockpit frame, but as the tank is below the engine, it always stays in the "open" position and is only to be used in an emergency. Also the fuel indicator, a clear tube with direct indication of the fuel itself, can only be seen by turning the head to the right and looking down at the rear cockpit wall. The wheel brakes are connected to the airbrake lever by cable. A genial system is the locking for use as a parking brake: A knob in the brake cable can be pushed behind a holder at the cockpit wall when the airbrakes are fully pulled. To undo the brake, the airbrakes just have to be pulled again, and the knob snaps out automatically. Simple and effective!

The canopy is held closed by two simple hooks, of which the left one is spring loaded to avoid unwanted opening. Emergency jettison is done by opening these two hooks, the canopy then swings open backwards and breaks away. For getting out quickly in an emergency, I missed a grip bar in front under the cockpit frame. The instrument panel was equipped with a basic instrument set, including

the rpm-meter, LCD cylinder head temperature indicator and engine time counter. The power and ignition switches as well as the the main fuse and the starter button are placed on a small own panel in the instrument panel, giving good and clear overview. For starting the cold engine, the main switch is set to “On“, the throttle to “Idle“, the choke to “closed“ and the ignition switch to “On“ – usual procedure for two stroke engines. After switching on the fuel pump for some seconds, and then off again, the engine is ready. After checking the propeller area clear it starts well by a short pressure on the starter button. After a short running time, the choke can be opened. If the engine is warm, the choke has to stay open for starting and, if the engine does not start immediately, the throttle should be placed forward to “max.“ for starting. During starting, the propeller unfolds immediately. Taxiing is easy with good overview, direct direction control by the rudder pedals, and the very effective brakes. For the take-off, the fuel pump is switched on. For my flight, the Piccolo with Me and a full fuel tank weighs around 275 kg, with the C of G in the middle of the range. During the ground run, the Piccolo accelerates good and straight. The engine turns with 4900-5000 rpm. With the stick slightly back, the nosewheel comes up and we are airborne at about 60 km/hr and a very short ground run. Crosswind does not have much influence. The best climbing speed is 75 km/hr. After reaching safety height, the fuel pump is switched off. The indicated climb rate is 2.5 m/sec, after 7 min I reach 1000 m above the 670 m MSL high situated airfield of Schramberg. Although running “full throttle“ all the time and warm weather, the engine temperature stays well in the normal range.

The cockpit comfort is good, with an excellent visibility, nearly not disturbed by the leading edges of the wing. If the “fresh air“ knob is opened, a good amount of fresh air is coming in through the opening under the canopy front frame. The cockpit noise is acceptable for such a light glider, a headset is not needed for radio communication, but might be wise for longer powered cruise flights. The controls are very light, and in turbulent air it can be felt that the whole aircraft is very light and requires some small corrections for flying straight on. The “comfortable cruise speed“ is about 120 km/hr, with the engine turning at 4900 rpm, requiring only 5-6 litres per hour of fuel. A maximum cruise of nearly 140 km/hr is possible using the maximum permanent rpm setting of 5500, then the consumption goes up to about 8 l per hour.

The behaviour in the minimum speed range is gentle: Below 60 km/h indicated airspeed, the Piccolo begins feeling soft, at about 57 km/h with the engine running idle a controllable staggering starts. With the engine running at full power, a 3-4 km/h lower minimum speed can be flown. Gliding, the nose nods down with the elevator fully up, if the stick is kept in this position, a wing may drop. Spinning, with the nose well down, is only possible by the use of the rudder, taking the controls back to neutral immediately stops the spin. Stalling speeds with the spoilers open are about 3 km/h higher, and the stall is more stable. The 45’ to 45’ rollrate at 77 km/hr is 4 seconds, handy, but not very fast for a small 13.3 m span. The reason is the fact that the simple rectangular wing produces a strong aileron drag specially at low speeds, and the rudder is not big enough to compensate this drag. This not so harmonic co-ordination is not as bad as it sounds, after a short flying time the pilot finds out the way to use the aileron drag to reach his aims faster when centring thermals at slow speeds: A short opposite aileron movement swings the Piccolo immediately into the centre of the thermal! A normal thermalling speed is 70 km/h, at lower

speeds in rough thermals some control movements are needed to keep good control. During circling, a bit of rudder and opposite aileron is needed to keep the bank constant. The control forces are low, so it is fun to fly the light glider in thermals. Although the min. sink rate of 0.9 m/sec seems to be rather high, the Piccolo climbs well in the thermals, as he is able to perform small diameter circles and stay in the centre without problems. The overall performance is about equal to that of a Ka-8 or an L-Spatz (Avialsa A-60), not too bad to do some nice “fun cross-countries“. At high speeds, the Vne is 170 km/h, the Piccolo flies stable and the elasticity of the wings gives a rather comfortable feeling, even though the low weight of the aircraft clearly can be felt in flight through turbulences. The trim setting range might be a bit wider, with my weight I was able to trim speeds from Vmin to 120 km/h in straight flight, for thermalling I would have liked to put the trim a bit further back.

Re-starting the engine in the air is easy, using the same procedure as described on the ground. If the battery is weak, it is also possible to fly faster (over 120 km/hr) and push the starter button shortly, just to unfold the propeller blades. They then are driven by the wind and do the rest to start the engine. With the engine running idle, a braking effect of the propeller can be felt. For the landing with or without engine, a basic final speed of 80 km/hr is recommended. With the airbrakes out, the nose goes down a bit and the trimmed speed increases by 10 km/hr, so that not trim changes are needed. The spoilers have an average effectiveness, but the Piccolo goes well down, specially with the engine running idle, if the nose is taken down a bit. The sideslip is easy to control and extremely effective, so that very steep descents can be made. A full sideslip is possible with full rudder and aileron, with the spoilers open the stick has to be held back a bit to avoid becoming too fast. Shortly before touching the ground, the spoiler lever should be moved about 1 cm forward from the “open“ stop to avoid the wheelbrakes being blocked during touchdown. Fully held off, the Piccolo touches the ground softly with nearly minimum speed, tailskid and main wheels at the same time. During this, the tailskid makes some noise if you are landing on a concrete runway, so that you immediately ease the stick a bit forward to stop that noise. The ground run is short, and easy to control even in crosswind, and the wheelbrakes are very effective. Also the suspension of the undercarriage is comfortable and well damped.

The Piccolo is a wonderful light aircraft for those who want to have fun, independence and cheap flying just for themselves, without thinking of huge competition flights. Touring flights of more than 400 km are possible without problems. Of course, this little aircraft can not be as perfect as its performant brother Carat (see our report in issue ....): The light and simple design specially of the rectangular wing results in having not the best control harmony within the slow flying speed range, and the engine installation also produces some drag even with the folding propeller. But: Which other motorglider can be bought for DM 55,000 (+ VAT and instruments), can be rigged without help and gives you lots of fun and economic flying? And: Which other motorglider can also be certified in the microlight category (still having the strength and fulfilling all the motorglider certification requirements), for which the needed license in several countries is much easier to get than a motorglider license or even a full PPL?

Jochen Ewald