



Training with petrol engine and on-board starter

High-quality motor gliders are equipped with an on-board starter for which the products of the FEMA company have an excellent reputation. Their range is now expanded by the compact starter for ZG 23, and Toni Clark introduced the Zenoah ZG 26 as predecessor of ZG 23 SL. MFI journalist Fritz Eickhoff thought of this as an interesting combination – not only for motor gliders: his article deals with experiences concerning engine and on-board starter as well as with a model aviation training with DIY gliders equipped with this combination

The first thought of a model maker when hearing »on-board starter« is of FEMA products. For motor gliders of a scale of 1:4 and bigger this manufacturer almost has a monopoly.

For many years Zenoah petrol engines ZG 23/38/45 and 62 have easily been started by FEMA on-board starters. There was at the most one cause for complaint: the cardan shaft between geared motor and freewheeling gear of larger petrol engines was dimensioned as predetermined breaking point in the case of blowback, but for many clients it sheared off too often.

However I knew of no other complaints. The construction is okay. Therefore I had no problems to accept the offer of writing a test report for MFI about the ZG 23 compact starter. Toni Clark contributed in November 2002 with a freshly imported

Zenoah ZG 26, the predecessor of ZG 23 SL at a price of only 339 Euro. The new one has three thimbleful more cubic capacity and a totally different cylinder with four overflow channels. This means a considerable increase in power especially when the engine is run with a resonance tube.

After an operating time of ca. 2 hours in which several Menz wooden propellers were tried at a dry and cold winter climate we produced the following results:

Prop	Rotational speed	Static thrust
18 x 8	8 500 U/min	8–9 kp
17 x 10	7 500 U/min	6–7 kp
16 x 10	8 800 U/min	7–8 kp
16 x 8	9 500 U/min	7–8 kp

These results are quite something especially since the resonance damper was not matched anew every time.

To make the sailplane complete I built with my model building project group a training model in a scale that was matching the new engine and starter. The proven Albatros built by Manfred Meyer zu Westram was increased in size by 25% and has now a span of 280 cm while the fuselage has a length of 225 cm. This is quite a big model for training! But it is according to the philosophy that while larger models are more expensive they are flying very smooth



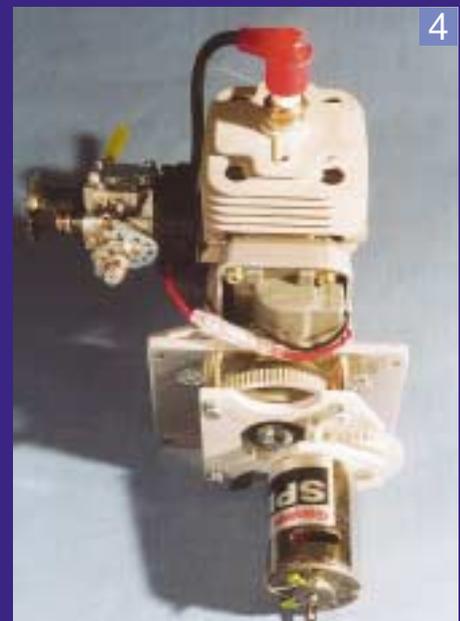
1



2



3



4



Absolutely recommendable is the choke flap control via the radio transmitter. Although the servo is just beside the ignition cable the DS 20 PCM receiver is not disturbed. A better solution is the control from the fuselage. This is easily possible when using an aspiration manifold by Toni Clark.

operated e.g. with Bel Ray synthetic lubricant can easily be put into operation even after a longer period without mothballing it specifically. Until now I did not detect sediments or corrosion in the crankcase.

The new ZG 26 makes a thoroughly manufactured impression and has a more attractive design than its predecessor. The shape of the cylinder alone promises more volume and more power. The carburettor

and are clearly visible over great distances. A petrol engine is an investment in operational security that keeps fuel costs limited. Furthermore, petrol is sold at every petrol station on the way to the aerodrome, even on Sundays. The on-board starter is also less likely to cause injuries during the starting process. The (new) pilot stands behind the propeller circle and holds his model in his hands – this is a plus in safety that cannot be overestimated especially when flying alone!

Here a comparison: Today, every moped has an on-board starter instead of the kick starter that was common some years ago. It is just cool to start by pressing a button. Why not using this technique with model sail planes? The increase in weight of the ZG 26 is exactly 563g including 10 Sanyo 500 AR cells. In the case of the Albatros this amounts to less than 10%.

Think about that the next time you are kneeling in front of your sailplane on a perfect flying day trying to get your igniter working. Finally it works out, you roll to the take-off area, accelerate hopefully and are lucky if your beloved sailplane stays the course until landing. According to my observations older igniters, especially four stroke engines, often fail in the air and



The complete ZG 26 aggregate seen from the side. This picture shows that the compact starter achieves a partial balancing of weight. The petrol engine is not as top heavy when attached to the engine frame which probably reduces the strain on the cells.

make a landing outside the runway necessary. Petrol engines however are much more reliable and therefore in my opinion ideal for pilot training and relaxed flying without stress!

Of course petrol has an unpleasant smell but is not as hazardous as methanol. It is important to consider this fact particularly when working with younger people. A final aspect is the lasting value of a petrol engine. The two stroke engine lubricants that we used are not corroding ball bearing and sealing. A two stroke engine that is

was removed for transport and recently includes an aspiration funnel made out of black plastic. All dimensions that are relevant for mounting remained the same, that means ZG 23SL can be replaced by ZG 26 without reworking it. The bracket plate with a width of 6 mm is made of stamped aluminium and would, of course, look finer as a CNC milled piece. However it includes already all M4 threads for attaching the starter. This makes a model maker happy!

The individual parts of the FEMA starter kit have an excellent appearance which

- 1 Here the crankshaft nut has already been replaced by the extension nut. A brass check ring separates the freewheel from the hexagon.
- 2 The big freewheeling gear is mounted. The coupling is connected with the crankshaft via a clamping ring when the M5 hexagon head screw is tightened.
- 3 The electric motor is flange-mounted to the premounted 1st gear level with two M3 screws. The aluminium plate of 5 mm was CNC milled and surface refined by the manufacturer.
- 4 The starting mechanics are attached to the ZG 26 mounting plate with 4 Allen screws M4x30 and distance bolts. The mounting plate is prefabricated with M4 threads which are arranged quadratically. This makes four different positions possible to fit them according to the conditions in the fuselage.

This is the brand-new engine already attached to the trainer model. Unfortunately the small fuselage cross-section prevents a complete integration of the on-board starting mechanics.





You get the first positive impression when you have the various parts of the on-board starter lying on your work-bench, packed neatly according to assembly units. The parts fit exactly which makes the assembly fun.

makes it fun to mount this set following the instructions. A full description is not necessary as all parts are packed separately according to their assembly units, and also detailed graphics are included.

Safety recommendations for mounting and operation are clearly formulated.

The producer recommends three switches that are connected in series: 1. main switch on the outside of the model, operated manually. 2. micro switch controlled by the throttle servo in such a way that it is only possible to start in idling speed position. 3. micro switch controlled by shifting servo.

This safety concept is principally alright but if the engine floods due to too much choke – that was it. In the air it is necessary to deflood the engine in full throttle position in order to start it again.

I only use high-quality PCM receivers for petrol engines and program fail-safe in such a way that in the case of disturbances the on-board starter does not start and the throttle servo goes into idle speed position. At an unintentionally wrong transmitter frequency immediately switch off first the transmitter and then the receiver in fail-safe mode.

At the end of November the large Albatros was at last flown in. As expected, the FEMA

compact on-board starter and ZG 26 petrol engine worked reliably straight away. It does not matter if the tank is attached to the level of the fuselage or somewhere under it.

Close the choke, accelerate a bit and let the starter run until the brand-new engine has enough petrol and makes its first sounds. Now open the choke and let the starter run until the ZG 26 runs properly.

A great advantage is the choke controlling via a 3-level switch on the transmitter. After a short time the user has found out how to use it and knows the perfect position for cold starting and during gliding stages. When the engine is hot you do not require choke – it is sufficient just to tip the starter switch.

Start the engine in middle position via the 3-level switch on channel 8 of the mc-20 transmitter and close the choke flap in front position at a still running starter. – A Graupner standard servo C507 with attached reversion stick (stock number

The members of the model making project are anticipating the training with the brand-new training model. A span of 280 cm and an engine with a cubic capacity of 26 ccm including on-board starter make their previous experiences trivial. That gave their motivation a boost. The boys from the model making team had only practised with light electronic gliders and really had to hold on to the ZG 26 when it was warming up.

3945) short-circuits the ignition and switches off the petrol engine.

Our trainer with a Clark Y-like shape can be operated very easily. After simply pressing a button it can be started, manoeuvred to the runway and brought up into the air: increase acceleration when starting and wait until the Albatros takes off. The flying height can be regulated just by the rotational speed. Thus untrained learners can concentrate on the direction of the flight that is controlled by the aileron joystick and learn co-ordination of the elevator with increasing routine.

All equipment and flight tests started in wet and cold November climate and were completed at the end of 2002 at temperatures considerably below freezing. The AR 500 cells with a weight of only 200g worked even at temperatures of minus 5C and ZG 26 started reliably. Of course: we had to try to find the correct choke position.

CONCLUSION

My conclusion after 17 years of experience with several home-made on-board starters for petrol engines: the brand-new ZG 26 as well as FEMA compact on-board starter are both optically and technically convincing. Both work well together, function excellently, make a lot of fun in everyday practice and thus make our demanding hobby safe and relaxed.

Fritz Eickhoff

