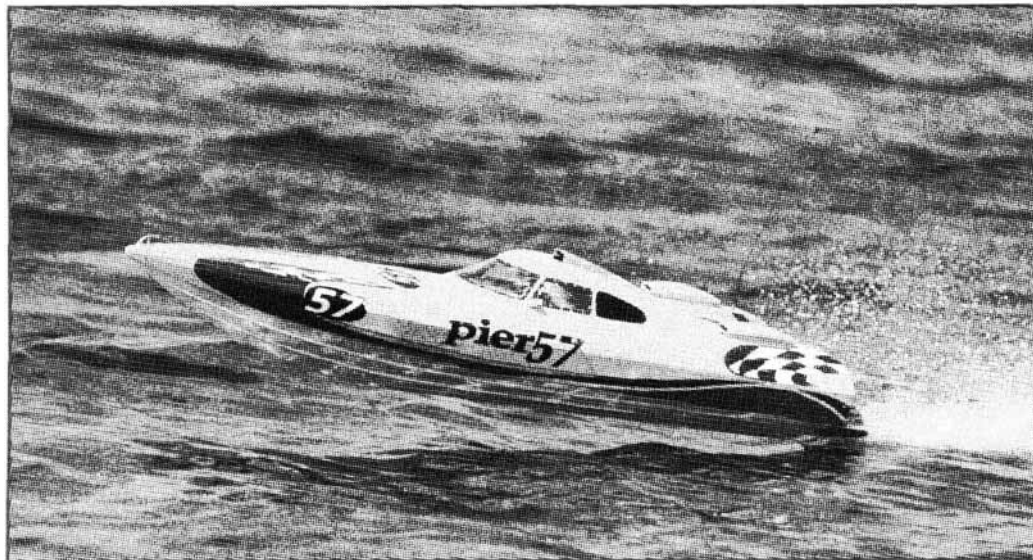
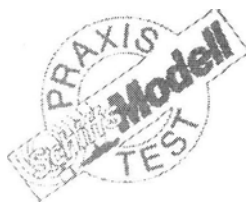


Andre Abtmeyer  
Gerhard Zimmermann



## FEMA Compact on-board starter for Zenoah engines

One day I received an email by Mr. Welz, editor in charge of the magazine *SchiffsModell*, in which he asked me if I would conduct an extensive test of an electronic on-board starter. Well, I had just disassembled my APACHE and wanted to do a general overhaul, and my „Drag-Cat“ is a real racer and not exactly suitable for such fancy accessories. But then I remembered that my fellow model maker Gerhard had just completed his CAYMAN. This starter would fit perfectly into his boat.

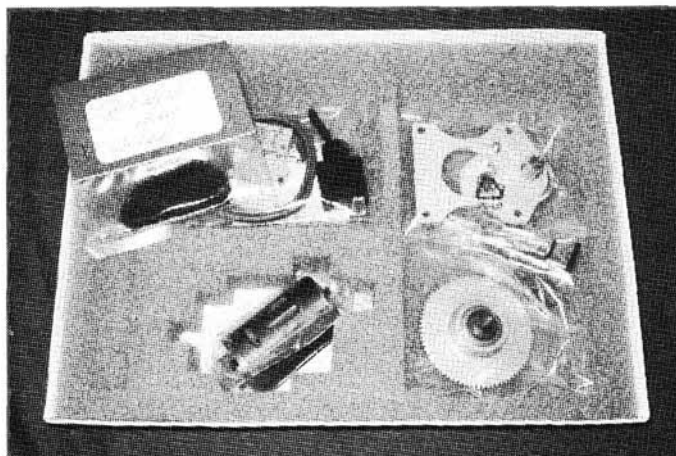
The basic set-up of Gerhard's CAYMAN is ideal for this experiment: his boat is not only equipped with a Zenoah PUM 260 with flanged centrifugal clutch but also with the MHZ-Z-Drive. The boat is completed with a wonderful airbrushed painting. This is already an extraordinary model and the electronic on-board starter would be the icing on the cake.

Accordingly, I quickly accepted the offer, and two days later I received a small parcel.

Gerhard dropped in with his boat the same night, and we opened the cardboard box together. Inside there was the FEMA compact on-board starter for water-cooled Zenoah petrol engines of the model ranges PUM 230/231/260. The cardboard box also contained the different components, clearly and neatly packed in plastic bags, as well as the multilingual manual.

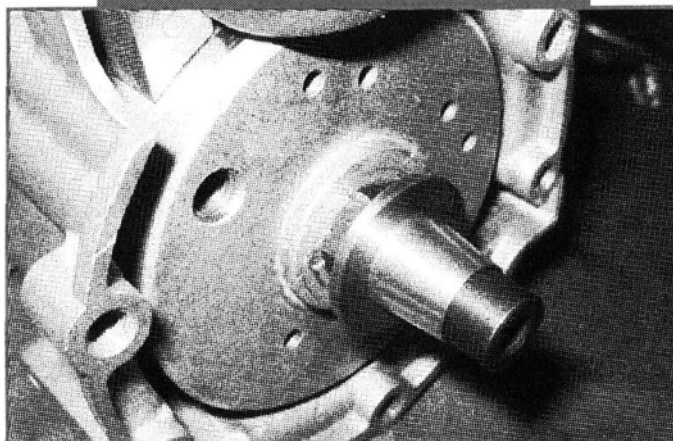
It is not necessary to peruse the manual thoroughly as it simply consists of one page with two figures, one draft and short explanations. After a skim through the manual we had comprehended the instructions and started the assembly.

At first we dismantled engine and pull starter and removed the engine mount. Then we removed the tappet and started the actual assembly. But due to the extension nut from bronzed steel this turned out to be quite difficult. It somehow seemed as if the thread wouldn't fit. But I kept trying because I thought that this couldn't be the case, and eventually the extension nut did fit. This very close manufacturing tolerance of the thread has after all the advantage that the nut is very tight and aligned with the crank shaft. No chance for wiggling or wobbling, it just fits! Of course we followed the instruction and secured the nuts with loctite.

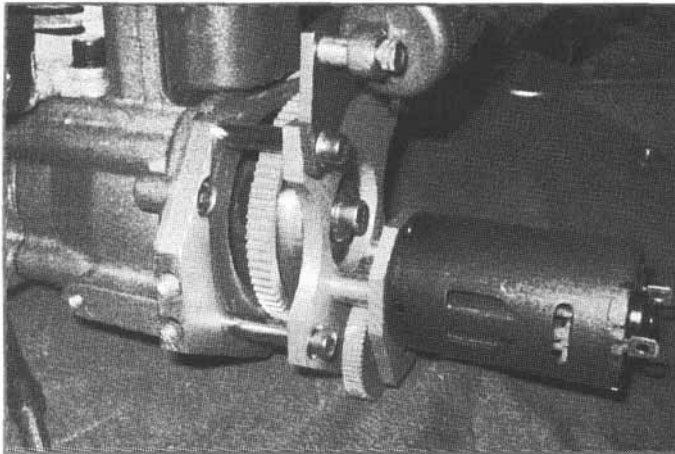


The parts included in the shipment of the FEMA on-board starter

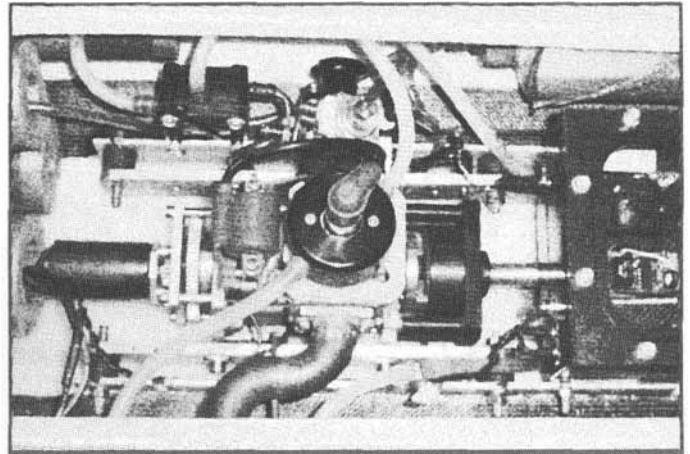
The above-mentioned extension nut



The remaining assembly was really easy. We attached the individual parts according to the drawing and finally screwed them together. I should mention that besides the obligatory tools (different screw drivers and wrenches) a piston stopper tool is necessary. You can purchase this tool at MHZ or prepare it from a M10 x 1 thread rod. (This is the so-called lamp thread. Suitable threaded pipes can be obtained in the electronic department of every DIY store.) We also needed a pipe wrench or a similar tool to loosen the standard starter tappet.



*This is how the completely assembled on-board starter looks like*



*After the reassembly into the model we can start the first test*

The assembly of the starter engine (a 3-pole standard engine of size 600) was no problem at all. But at this point the question came up why the starter of a marine engine was not delivered with standard stainless steel screws but with simple steel screws instead? It probably had nothing to do with the necessary retention force.

After the reassembly of the engine mounting plate we screwed on the gear unit with the electronic motor instead of the pull starter. You should follow the instructions and provide a positive allowance of the gearwheels to assure a long durability as the combination of steel and aluminium bevels require a correct distance.

We soldered the connection cables to the starter engine and then established the connections. Instead of the toggle switch that is recommended in

the instructions we mounted a 1-channel relay switch by robbe that can be controlled via radio control. The luxury of an on-board starter would make no sense if it could only be handled manually in the model.

Also in contrast to the recommendation in the instructions we used an 8-cell battery instead of a 10-cell battery. FEMA recommends an 8-cell battery only for the starters of aircraft engines as the required rotation speed for the start of the marine version supposedly is higher – but I cannot follow this presumption.

Our decision was confirmed in the realisation. After the reassembly of all parts into the boat the pump integrated in the carburettor took in some fuel. Then we switched everything on, pushed the button of the starter switch at the emitter ... and the engine started immediately!

There were no problems with a wailing starter but only a short sound at the start before the Zenoah ignited.

We were amazed although that is the job of an electronic starter. Nonetheless we both were sceptical, but only in the beginning! The on-board starter clearly had convinced us. Of course we tested the on-board starter extensively over the following weekends.

### *Conclusion*

The FEMA on-board starter functions flawlessly. Of course we cannot predicate a long-term wear resistance, but until now we definitely couldn't find any indications of wear at the gearwheels. With some maintenance the on-board starter should give you pleasure for a long time. The open design of a

boat may of course be the cause for some problems. But there are also other components in a boat that are exposed to corrosion, so this shouldn't really be a problem.

You can use an 8-cell pack with ca. 1 Ah capacity as starter battery as the starter runs only a few seconds at every starting activity. The overall concept has only the drawback that the pull starter is completely replaced. Thus we have no possibility to start if the starter battery shouldn't work for whatever reasons.

### *Source of supply:*

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