

**EUROPA CLUB**

**AIRCRAFT MODIFICATIONS**

**OVERVOLTAGE  
CROWBAR UNIT  
INSTALLATION**

**(MOD NUMBER 10404)**

**Issue 5: July 2003**

**(incorporates amended regulator connections as issued by Europa Aircraft —  
XS Page 25 - 11 Issue 4 for Rotax Engines)**

**(incorporates corrections relating to capacitor for Rotax engines)**

**(incorporates redrawn Rotax regulator wiring for improved clarity)**

**(incorporates updates to purchasing & contact information, and Rotax circuit  
amendment to ensure relay closure before engine start)**

# **EUROPA CLUB AIRCRAFT MODIFICATIONS**

These modifications are separate from those issued by the factory but have been approved by the PFA. They can be considered as build instructions and should be carried out in consultation with your PFA inspector before submitting the paperwork to the PFA for final approval. Most modifications add weight. Beware of incorporating too many at the expense of performance and payload. When following these instructions read at least three times, measure twice, cut once.

Be sure you fully understand the instructions before proceeding. Any queries please contact me on e-mail <nigelcharles@tiscali.co.uk> or telephone 01380 860620. If you have any suggestions to improve the modification I would be pleased to pass them on to the PFA for their consideration. On completion get the modification checked and signed off by your inspector quoting the modification reference number on the front cover of this build instruction and submit the application to the PFA.

Nigel Charles

## **OVERVOLTAGE CROWBAR UNIT**

This modification is highly recommended as it gives protection to the electrical system with minimal weight and cost penalty. Any builder of a Europa requiring a serviceable electrical system to keep the engine running (Subaru for example) should consider a crowbar unit as essential. A voltage runaway is the most likely reason for total electrical system failure and is caused by certain types of regulator malfunction. The crowbar unit works by intentionally shorting a circuit-breaker to earth which then trips isolating the alternator from the rest of the system. (NOTE: the protection element must be a circuit-breaker; a fuse is not suitable in this application; see the AeroElectric Connection for the rationale) This protects the battery so that it can provide electrical energy until an expeditious landing can be made. The modifications to the wiring depend on the type of alternator. It can be a simple addition when field controlled alternators are used (Subaru for example). In the permanent magnet case (Rotax for example) an extra relay and circuit-breaker are required.

### **Purchasing Tips**

The crowbar units are available from B&C who are now the suppliers for items from Bob Nuckolls' AeroElectric Connection. In the UK they are available from Pete Smoothy at Airworld. If you require a relay these are readily available from many outlets. Just make sure that it is rated for the necessary current handling. For Rotax engines a 30 amp rating should prove adequate.

## **OVERVOLTAGE CROWBAR UNIT INSTALLATION**

Before installation you may wish to check the operation of the crowbar unit. These units are very reliable but it is a good idea to check that they operate at the voltage required. To do this you require a variable voltage supply with a maximum output of at least 18 volts. Wire the unit in series with a car sidelight bulb ensuring the red wire is to the positive side of the supply. With the voltage set low turn on the power. The lamp should not illuminate. Now wind up the power and note the voltage at which the light comes on. This value should be about 15 -16 volts. Once on the voltage will have to be reduced significantly before the light goes out again. The check is now complete.

The exact position and mounting of the unit (and relay if required) will depend on individual wiring layouts. The determining factor will be the position of the regulator. If you have yet to start wiring the system on top of the port footwell is as good a place as any. Deciding which type of alternator you have is the next step. Subaru engines use external alternators usually of the car type. These are invariably field controlled alternators. Rotax engines all use crankshaft mounted permanent magnet type alternators. For other engines the type is likely to depend on the engine's original designed usage. Motorcycle engines tend to use permanent magnet and are usually crankshaft mounted. External belt driven alternators tend to be of the field controlled type. If you have any problems deciding which you have please contact me for advice.

### Field Controlled Alternator

The installation could not be simpler. Connect the red wire of the crowbar unit to the alternator field wire and the black wire to earth (Figure 1). Support the unit by tie wrapping it to a supported wire. The installation is now complete.

### Permanent Magnet Alternator

This installation is slightly more complicated as there is no direct control on the alternator's output. The regulator takes the output rectifies and regulates it to a safe level for the battery. As we are catering for regulator failure the only way to shut down alternator output is to isolate it from the rest of the electrical system. This requires the use of a relay with contacts capable of handling full output current. Also a circuit-breaker is required. Connect up your alternator output as shown in Figure 2. The 22000 $\mu$ F capacitor shown is the standard one used with the regulator for the Rotax alternator. Please note that when wiring up the circuit-breaker is connected to earth not the main busbar.

