

## Micro CIP Custom Intelligent Propeller



Jabiru Engine 80 HP, 120 HP, 180 HP

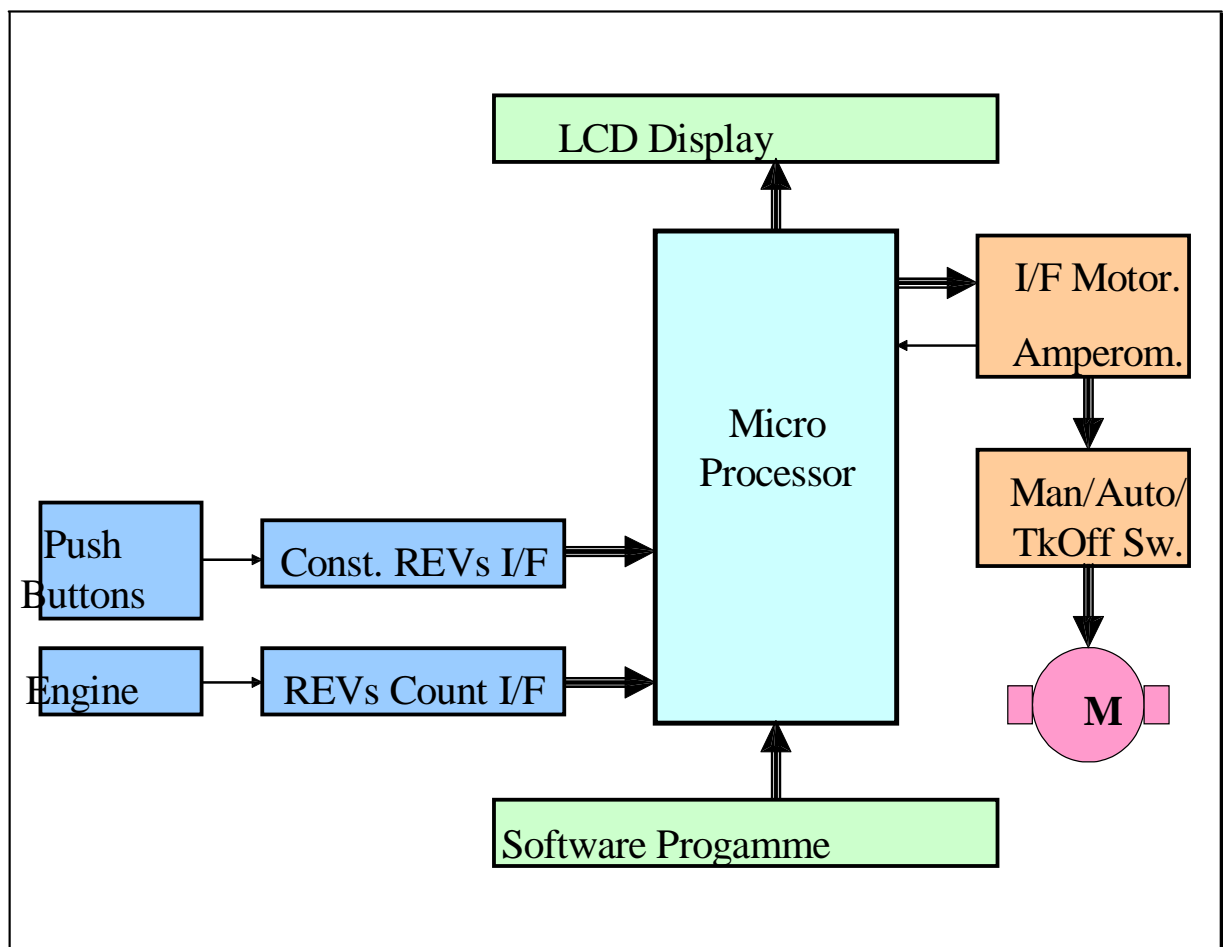
## Micro Custom Intelligent Propeller for Jabiru Engine

### General Description.

**Micro CIP**, Custom Intelligent Propeller controls the pitch of your electric variable pitch propeller.

A **Main Unit** and a **Display Unit**, integrated within one single case, make up the **Micro C I P Custom Intelligent Propeller**.

### C I P. Custom Intelligent Propeller schematic diagram



Legend:

- LCD      Liquid Christal Display. I/F Interface.
- REVs     Engine Revolutions
- Sw        Switch
- Push     Buttons + -
- Press    Pressure

## Micro C I P. Custom Intelligent Propeller Main Unit

The **Micro C I P Main Unit** is made up by a two face rectangular Printed Circuit Board.

It contains:

- 1) The Microprocessor that executes the program to control the pitch of your propeller.
- 2) An EEPROM (Electrically Erasable Programmable Read Only Memory) to store the program.
- 3) An EEPROM used as non volatile memory to store the custom parameters associated with the Aircraft model and the adopted propeller type.
- 4) An Analogue to Digital converter necessary to digitalize the input parameters to the microprocessor.
- 5) A digital counter to measure the engine Revolutions (Revs).
- 6) An Ampere-meter to monitor the propeller motor current.
- 7) A relay to switch to manual mode.
- 8) Two high current relays used as actuators back / foreword



The **Display Unit** is contained within a black PVC round support of standard dimensions (57 mm), suitable to be installed on the dashboard as a normal aeronautical instrument.

It contains several commands and indications.

### **COMANDS:**

- 1) A three position switch to select the functional mode a. **Take Off/Landing**,  
b. **Manual**,  
c. **Constant Revs.**
- 2) Two push buttons + – for various adjustments, depending upon the contest. a. When in

mode Constant Revs these push buttons adjust the target revs within the range 1500 to 3050 RpM.

b. When in manual mode these push buttons increase and decrease the propeller pitch.

c. During the setup phase, these push buttons increase and decrease the value of the selected parameter.

3) A push button to **Set** up the system parameters.

### INDICATIONS

4) A digital LCD display 16 characters, on two rows, wide reading angle. With LED Backlight.

5) A **Green LED** indicates the **Minimum** propeller pitch end of range and a **Blue LED** indicates the **Maximum** propeller pitch end of range.



## How does Micro C I P work?

### **Manual Mode:**

The pilot may decide to adjust the propeller pitch manually, in case he so desires or in case of system malfunction. Put the switch in **Man** mode and adjust your propeller pitch using the +/- push buttons. Obviously Takeoffs and Landings are executed with the minimum pitch.

### **Constant Revs. Mode (1500-3050 Giri / Min):**

The pilot sets the switch '1' to Auto/Cnst position and pushes the 'Set' in order to read Cst on the bottom left side of the Display.

Then it adjusts the "target" engine Revs by the + or – push buttons. The Target value is shown in the bottom right corner of the display.

The system will adjust the propeller pitch in order to attain the expected engine Revs (Target Value +/- 50 Rpm). This is the traditional mode used

in aeronautics; you get the number of constant revolutions independent of the aircraft flying conditions and independent of the **MaP** (Manifold Pressure), obviously within the technical physics constraints.

### **Display Description.**

**Rev 2900**

**Cst 2900**

**2900 on top line**

Indicates the engine revs.

**2900 on bottom line**

Indicates the target revs. When engine revs coincide with target revs, the propeller pitch is adjusted onto the correct value

**Cst**

Indicates that the system is in **Constant** Mode.

### **Installation.**

#### **Mechanical Installation**

Jabiru engines require the use of a REVs Pick up BALLUFF BES 516-324-E4-C-03.

A. This proximity sensor is to be installed on a supporting bracket which holds it near the

aluminium rotating hub of the propeller.

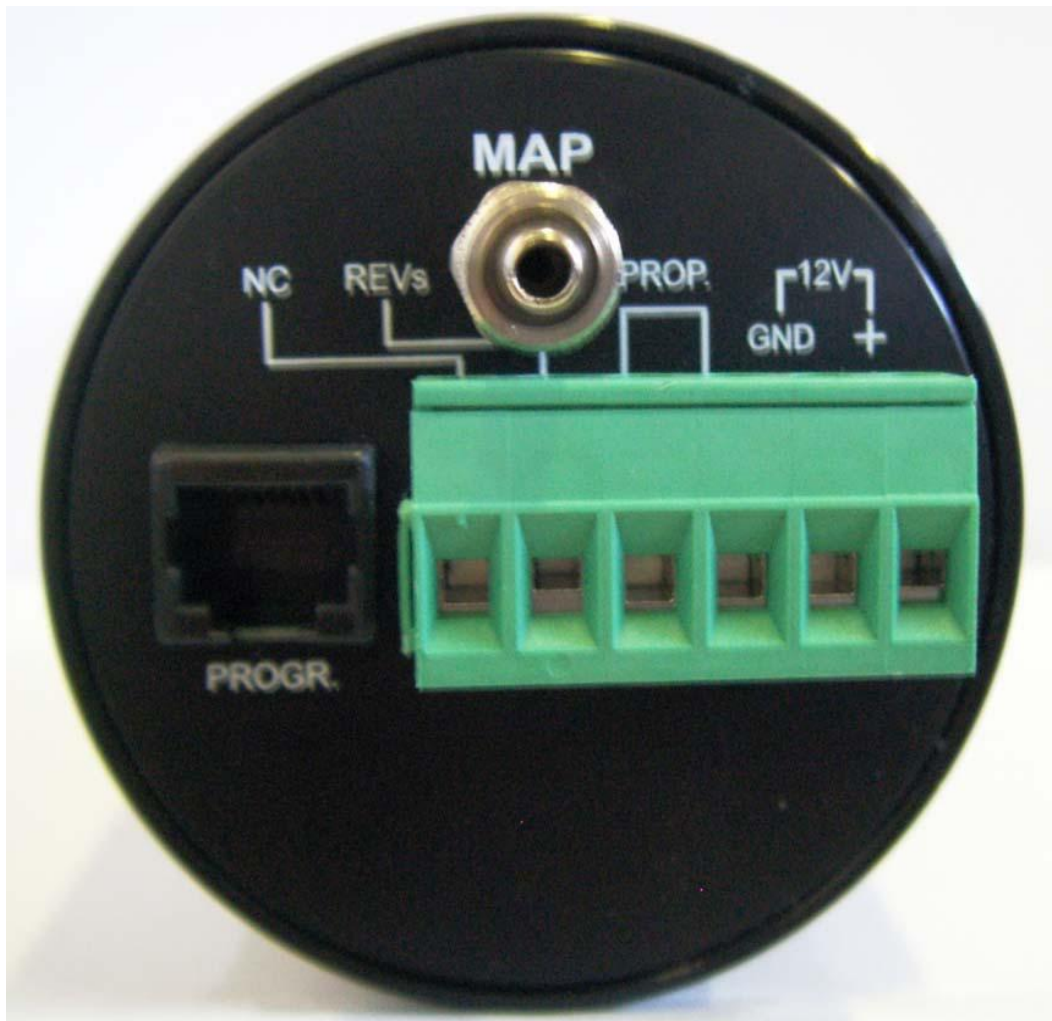
- B. The aluminium propeller hub must have a pair of 6 mm steel bolts mounted 180 degrees from each other. It is important that the steel bolts are installed on an aluminium rotating body or else the sensor will not be able to read the magnetic fields.
- C. The sensor will see the two bolts passing by for each and every propeller revolution so that your governor can count the number of passages per time unit.
- D. The gap between the sensor head and the bolts' head is to be adjusted as close as possible, however less than 1 mm.
- E. Make sure that the supporting bracket does not vibrate when the engine is running or you may have either false readings or mechanical interferences between the bolts and the sensor head or both.

### **Electric Installation**

Jabiru engines require the use of a REV's Pick up BALLUFF BES 516-324-E4-C-03

The Micro CIP Unit has a six-pin connector on the back. From the right end side moving to the left we find:

- A) **Positive pin.** Connect the positive +12V through a switch and a fuse (or a thermal circuit breaker) on the dashboard. Such fuse is to be of a value suitable to supply the proper current to the installed propeller.  
Usually 50% more than the max current drawn in normal operations.
- B) **Negative pin.** Connect to Gnd and to the **Blue wire of the REV's Pickup**
- C) **PROP** two pins in the centre are to be connected to the propeller motor.  
See 'Functional Test', further on, to determine their polarity.
- D) **REV's wire** is to be connected to the **Black wire of the REV's Pick up.**
- E) **NC** Connected it to the **Positive wire of the REV's Pick up, Brown wire.**



### **Functional test.**

- 1) Switch on the master and the Micro **C I P** switches.
- 2) Observe the display, you should see a similar reading to this:

**Rev 0000**  
**Man 000A**

Should the script not appear, make sure the 12V is ON, particularly check fuses and polarities; with inverted polarities the fuse blows and the **Unit** may get damaged.

Notice the **Unit** will stay in **Manual** mode even if Switched to **Cst** or takeoff because the engine is not running.

The propeller motor current reads **000A** (bottom line) and the top line reads **0000**.

- 3) Keep the Unit in **Manual**.
  - 4) Try to Increase and Decrease the Pitch by using the PITCH Switch + / Listen to the relays activating on the **Main Unit**; notice the LED's, the green light, should go on when activating **Pitch -**, the blue light, should go on when activating **Pitch +**.
  - 5) Increase the propeller pitch (+); make sure the pitch of the propeller does increase.
  - 6) Decrease the propeller pitch (-); make sure the pitch of the propeller does decrease.  
In case the pitch went the opposite directions, reverse the wires at the propeller electric brushes.
  - 7) Make sure the propeller pitch motor stops at the two end positions.  
The **Green LED** must light when the propeller reaches the **Micromum** pitch.  
The **Blue LED** must light when the propeller reaches the **Maximum** pitch.
  - 8) While you manually increase or decrease the propeller pitch, you can read the value of the intensity of the current drawn by your propeller motor.  
The value is shown on the right bottom corner of your Display and is indicated with an accuracy of 1/10 of Ampere.  
This read value will increase or it will drop to zero when the propeller reaches one of the two ends of its range.  
It drops to zero when one of the “end of range” micro-switches opens the electric circuit thus stopping the propeller motor.  
It increases if the propeller does not mount “end of range” micro- switches and the blades reach their mechanical end of range.  
Adjust the threshold current value as explained further down in the setup section.
- NOTICE**, *if your propeller does not mount end of range micro-switches, when you are in Manual mode, let the push button off as soon as the propeller blades reach their Max or Min mechanical limit.*
- When the system is in **Automatic** or **Constant** revs mode, when the blades reach their end positions, the circuit is opened automatically by the CIP, providing the setting up of the current thresholds is correct.*
- 9) Switch off Micro **C I P**.
  - 10) Start the engine.
  - 11) Switch on the Micro C I P.
  - 12) Make sure the indicated Revs are correct.

If the Revs counter does not work, Micro CIP remains in forced **Manual** mode, no matter the mode selected by the selector switch.

- 13) Switch to **Constant** mode by pushing the Set button and observe the script **C** on the bottom display line. Using + or – push buttons, the target Revs range from **1500** to **3050**.
- 14) Set it to 1500 and rev the engine up to more than 1500. Observe that after the reaction time of the propeller, the engine should rev down to 1500 +/- 50 Revs.
- 15) Switch to **Takeoff** and observe the script **3300** (Takeoff 3300) and eventually the **green LED lit**.

### **In case of malfunctions**

If the Revs counter does not work.

The system will force to Manual mode. This Display will show:

③ **Man 000A**. On the bottom line.

If the computer does not work.

The system will still work in **Manual** mode.

### **Electric protection of Micro C I P**

**Mini CIP** comes with a 20 Ampere fuse on the main unit.

In addition a dash board fuse or a thermal circuit breaker is to be installed to protect the assembly “Propeller – CIP”.

The value of such fuse is normally double the normal propeller current.

As an example, if a propeller requires an average of 7 Amps to work the thermal circuit breaker on the dash board is to be 15 Amps.

### **Adjustment of the threshold current to supply to the propeller motor**

The propeller current threshold depends upon the type of propeller mounted. In fact every propeller absorbs its specific current. However when the blades approach one of the two end positions the absorbed current increases considerably and proportionally with the increased effort of the motor.

Some propellers will never reach this condition thanks to “end of range micro - switches” that open the electric circuit before the blades get to their mechanical ends.

Micro CIP can find out when the blades are at their end positions with both types of propellers with or without micro–switches.

The propeller current threshold is to be set up on a case by case basis, usually the current threshold value is adjusted for the Minimum (Green)

to 50% more than the current used by the propeller when it decreases the pitch.

Also, the current threshold value is adjusted for the **Maximum (Blue)** to 50% more than the current used by the propeller when it increases the pitch.

## **System Setup**

To enter the setup mode switch on Custom Intelligent Propeller while pushing the Set button on the Display Unit.

If, however, CIP is in **Manual** mode, the setup mode does not activate.

If it is in **Automatic Constant** mode, all the values previously set by the user are kept and may be either confirmed, increased or decreased one at the time.

If in Takeoff mode, the values of all parameters are returned back to their defaults and may be confirmed, increased or decreased one at the time.

The system parameters are shown one at the time to allow the user to confirm or change them.

The current value of the parameter under focus is shown on the display and it may be confirmed by pushing the Set button, soon after the system will show the next parameter.

The value of the parameter under focus may also be increased or decreased using repeatedly the push buttons + / - until the wanted value is obtained, then the parameter is confirmed as explained above.

When all parameters are scrolled and confirmed, the system switches to normal mode.

The parameters which may be changed are the following:

1. **“Curr Adj. Grn”** Adjusting of the threshold current absorbed by the propeller pitch motor when the blades are approaching close to the Minimum pitch.
2. **“Curr Adj. Blu”** Adjusting of the threshold current absorbed by the propeller pitch motor when the blades are approaching close to the Maximum pitch.
3. **“User Crr”** Revs value, user chosen, to offset the engine power curve in accordance with the user desire.
4. **“Max Crus”** Maximum revs number during the cruising phase for both aspirated and turbo charged engines.
5. **“Min Revs”** Minimum revs number during the cruising phase for both aspirated and turbo charged engines.
6. **“Takeoff”** This revs value is kept during the take off for the first 2 ½ minutes. If the take off lasted longer the system switches to the take off revs low value.
7. **“Max Cont”** Maximum Continuous. This value is kept during take off after the first

2 ½ minutes.

8. “Aspir0 Turbo1” Select 0 for aspirated and 1 for turbo engines.

### **Notes on the mechanical set up of the propeller**

We suggest adjusting the mechanical minimum of the propeller pitch as to allow for a number of maximum revs slightly less than the maximum recommended by the engine vendor for the take off phase.

As an example, for Jabiru engines 80 and 120 HP we suggest to adjust the maximum revs when the aircraft is in a stand still position at 3200-3250 revs. The maximum REVs being 3300 revs.

The maximum pitch should be some 10 degrees more than the minimum.

### **A test for propellers with Jabiru engines:**

1. Make sure the aircraft brakes are engaged so that the aircraft cannot move and the engine is at its normal working temperature.
2. CIP in Manual mode. Adjust the Propeller to its Minimum pitch, put the engine full throttle, Revs should read 3200 RpM.
3. With the engine at its maximum power, increase the propeller pitch and observe the Revs decreasing, when the pitch reaches its Maximum the Revs should be 1500 RpM.
4. Switch to Constant mode and adjust the Target Revs, using the CIP knob, to 3150 and then to 1500. The engine revs should adapt and follow your target values.

### **The first Flight**

If all the listed tests were positive, fly your aircraft with the **C I P Custom Intelligent Propeller in Manual Mode**, taking off with the propeller at minimum pitch (Green LED lit). Obviously make sure not to exceed the Maximum engine revs as you take up speed, in case it happens you need to increase the propeller pitch manually as necessary.

Switch to **Automatic** mode only, after reaching the safety height and only if the values of the Revs., Speed and MaP are reliable and trustworthy.

Change flying conditions to force **Mini C I P, Mini Custom Intelligent Propeller**, to adjust the pitch in all possible flying conditions.

Take off and land in automatic mode only after you have gained more than enough confidence in the system and certainly not before having tested it thoroughly.

### **Responsibility and liability**

Responsibility and liability is totally and utterly with the Pilot and with the owner of the aircraft. In no circumstances we are responsible for damage to people or goods.

We remind you that for safety reasons take offs and landing should be executed in manual mode with the pitch adjusted to the minimum.