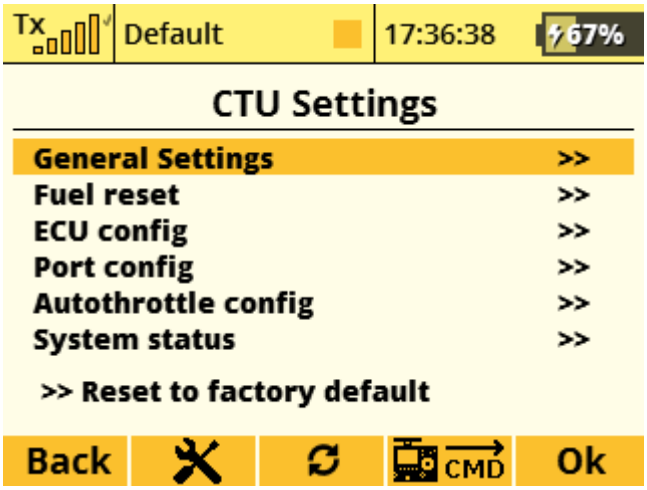
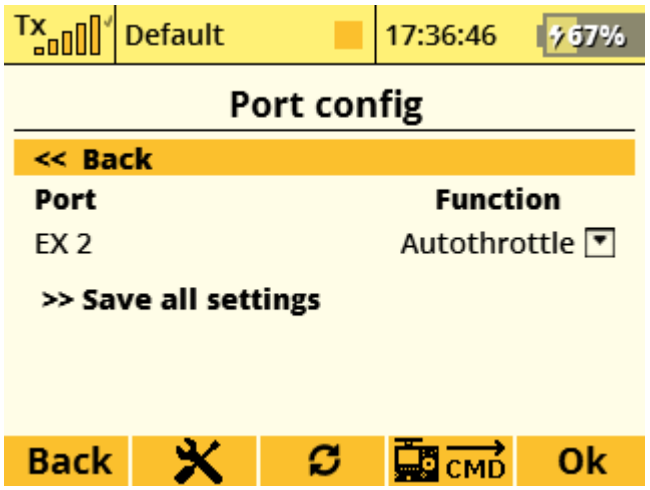
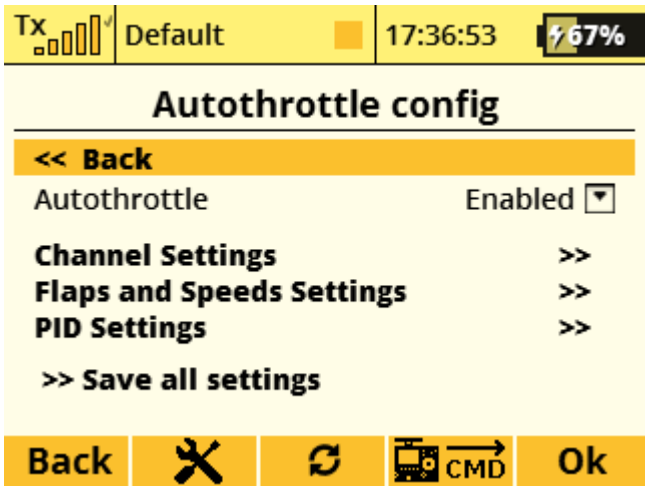
CTU Jeti Auto-throttle Operation

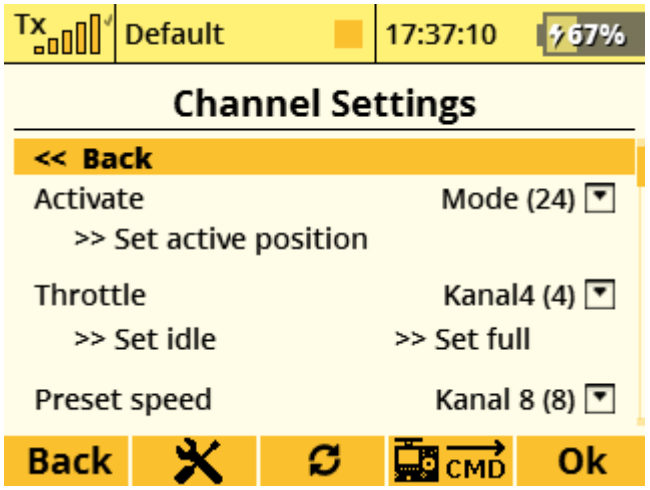
C Groen



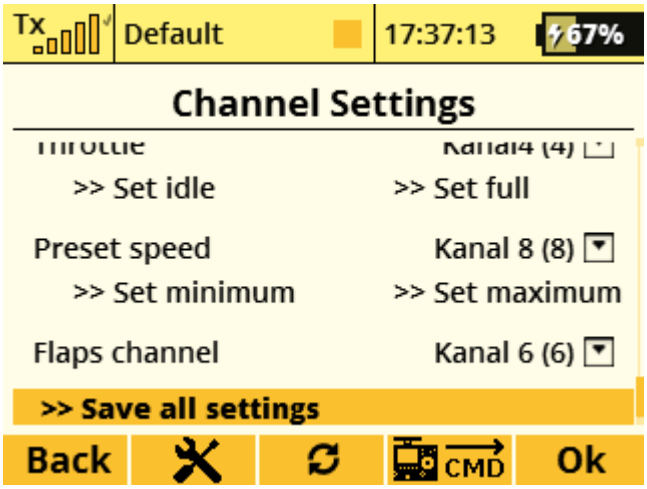
Connections :
your Throttle cable MUST be connected to your CTU EXT 1 Port
Your IAS must have a Special CTU Firmware , and MUST be connected to port EX2.



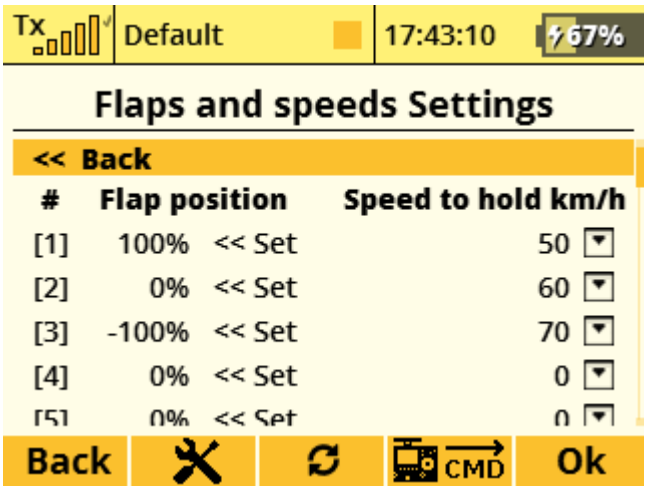




Set the Activate to a 2 position switch 1 is OFF 2 is ARMED
Set Throttle Channel to your Throttle channel
IMPORTANT! First Relearn your Turbine again , the CTU uses a different PWM range.
When you press “SET IDLE” Make sure your Trim is in UP position (otherwise the AT function Can turn your Turbine off)
Use a Slider for the Preset speed!



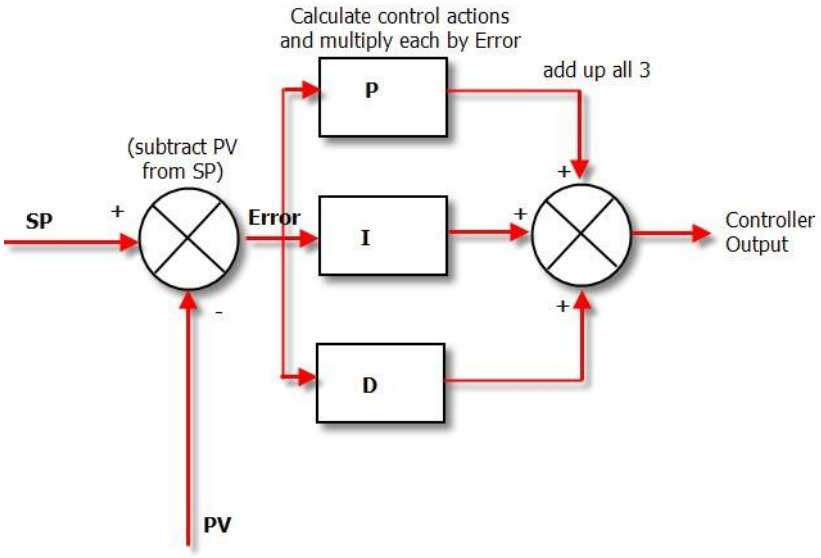
Set your Flap channel to your corresponding Channel.



Principles of operation

The CTU device has an auto-throttle function built in (usage is optional). The auto-throttle function's job is to try and keep the plane flying at a specific IAS. Basically, the auto-throttle function is a "black box" inside the CTU device and is fed with the current IAS and the IAS it has been set to achieve (setpoint). The output from this box is a throttle setting. This setting depends on the error (difference) between the current IAS and the setpoint. The larger this difference is, the higher the change in throttle setting will be. To help soften the reaction to the throttle output 3 parameters are also input to the auto-throttle "black box". These parameters allow the algorithm to select an optimum throttle output. The algorithm in use is called a "PID controller". The PID controller looks at the difference in the IAS and control the throttle output according to this difference using the 3 parameters (kP, kI and kD). The parameters are quite sensitive to changes. The default values in the "CTU Configuration Tool" seems to work well with most JetCat engines, being not too aggressive nor too soft.

The figure below shows the principles of the PID regulator. The "SP" is the setpoint (the IAS we want to reach), "PV" is the current IAS, "P", "I" and "D" are the 3 parameters (kP, kI and kD) that helps the PID controller control the throttle ("Controller Output" in the figure).



Picture 1 PID Controller

Safety features

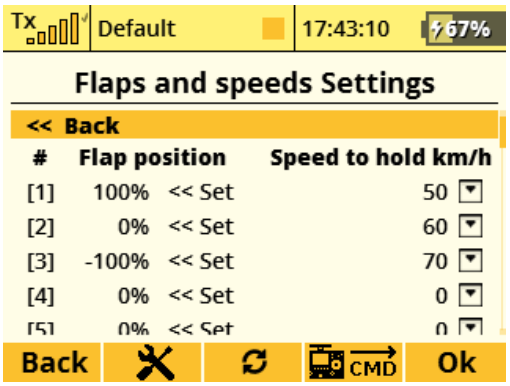
A number of safety features are built into the auto-throttle function. First of all, the function can NOT be enabled before the IAS is above 40 km/h, (to prevent it being enabled on the ground by accident), the control switch (2 position) needs to be in position 2 (auto-throttle) and the throttle stick needs to be brought to idle. When all of the above are true the auto-throttle will be active and take control of the throttle to the engine. To disengage the auto-throttle you can either flip the control switch to 1 or move the throttle stick away from

idle (even a short movement will cancel the auto-throttle). When the auto-throttle has been disengaged you have to go through the same procedure again to enable it (control switch must be moved away from auto-throttle position, throttle to idle, and IAS of plane must be above 40 km/h). There is no specific sequence the above enabling procedure must be carried out in. Typically it is easier to bring the control switch to position 2 (auto-throttle) and then when you are ready, bring the throttle stick to idle. The auto-throttle will then be enabled.

As the auto-throttle gets its IAS input from the pitot tube, it is extremely important that it is kept in good working order (e.g. beware of insects etc. blocking the openings)

Source of target IAS

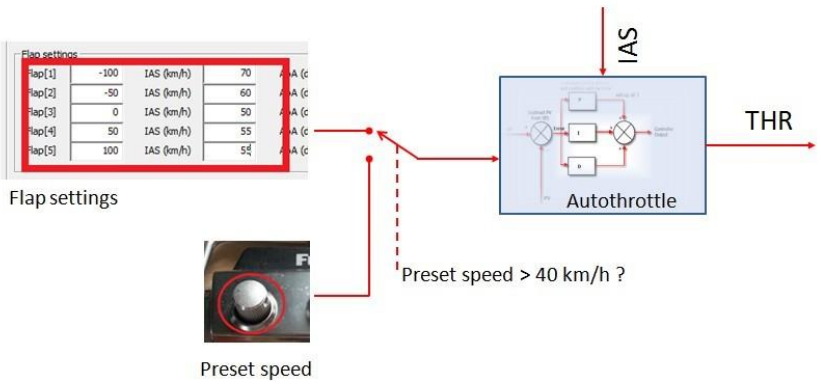
The required IAS value to the auto-throttle function (the speed we want the plane to adhere to) can come from two different sources. The first possible source is from the "Flap settings" in the AT Menu / Flap settings



Picture 40 Target speed versus flap settings

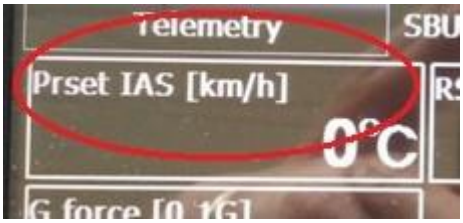
Remember the numbers in the "Flap fields are the channel positions for the flap channel
The values in the "IAS (km/h)" fields are the speed the auto-throttle should try to follow.

The second possible source is the "Preset speed" (from 0 to 250 km/h) dial. If the dial is set higher than 40 km/h, the value selected will be the speed the auto-throttle will try to reach if the auto-throttle function is enabled. If the dial is set to less than 40 km/h, the IAS in the "Flap settings" group will be used by the auto-throttle function.



Picture 41 Source for target IAS

Whenever a new target speed for the auto-throttle is selected (by changing flap settings or turning the "Preset Speed" dial, the telemetry value for "Prset IAS [km/h]" will show the new target speed.



Picture 42 Target IAS

For example if the landing configuration is controlled by a condition, you could set the Preset speed dial to "0". This would mean that the auto-throttle, if activated, would get its target speed from the flap settings group independently of the position of the Preset speed dial.

WARNING

PLEASE remember, the auto-throttle function is not a "solution to all problems"! It can only do it's best to reach the programmed IAS, it can only hold the target IAS if the engine is fast enough and the orientation of the plane is not changed too quickly (e.g. if it is keeping the IAS constant in level flight and the pilot suddenly pulls the elevator hard, the auto-throttle (and the engine) will take some time to react and keep the target IAS). If you are not comfortable using the auto-throttle function please do not use it!