

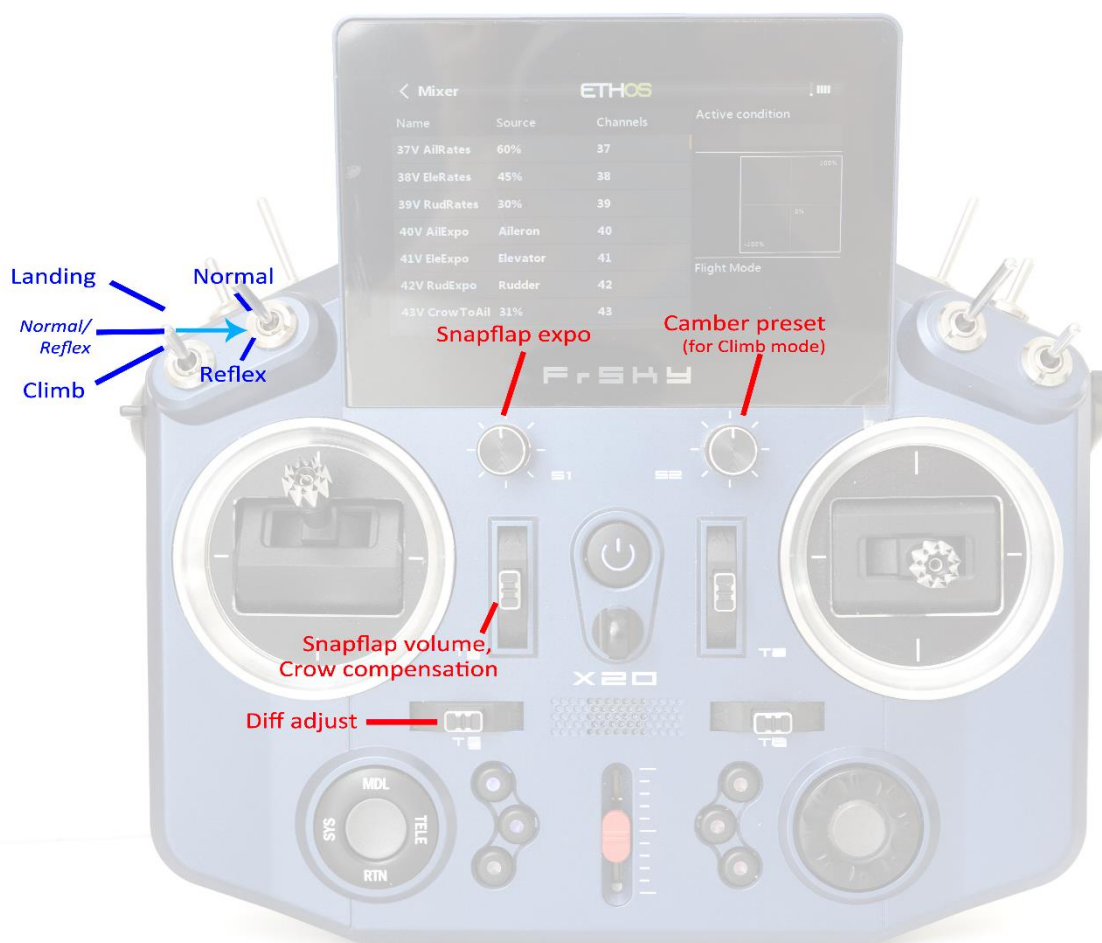
F3F template for ETHOS

Version 1.0

Setup Guide

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F3F template control layout (Mode 2 shown)

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1 INTRODUCTION

1.1 DESCRIPTION

F3F for Ethos is a template for slope soarers with six servos (2 in the fuselage and 4 in the wing). It's closely based on the author's well proven OpenTX template.

It offers all the features needed for F3F class moulded models. Setup is quick, and an integrated CAL mode ensures perfect tracking of all surfaces. Key mixers can be adjusted in flight.

Application

- For 6-servo gliders
- V-tail and X-tail
- Any stick mode

Flight modes

- NORMAL, REFLEX, CLIMB, PUMP, and LANDING
- Voice confirmation on change of mode
- Customisable flight mode switches

In-flight adjustments

- adjuster for snapflap volume
- adjuster for snapflap expo
- adjuster for aileron diff
- adjuster for camber preset
- adjuster for crow-to-elevator compensation

Crow functions

- Choice of deployment methods
- Automatic differential suppression
- Reverse Diff
- Crow/elev compensation with multi-point curve
- Adjustable deadband on crow control.

Control surface calibration

- 'CAL' mode for adjusting servo centres and limits
- Balancing curve for flaps for accurate tracking
- Full rotation on flap servos

Other

- Channels 7-9 free for motor etc.

PLEASE READ THROUGH THESE INSTRUCTIONS ONCE BEFORE STARTING!

FOLLOW THE INSTRUCTIONS IN SEQUENCE!

1.2 PACKAGE CONTENTS

Filename	Description
f3f-ethos-10_setupguide.pdf	Setup guide
f3f-ethos-10x_reference.xls	Programming reference
f3f-ethos-10x_{ <i>ethos ver</i> }.bin	Model file (configurable for X- or V-tail)
*.wav	Sound files

1.3 REQUIREMENTS

The following are required:

- FrSky transmitter running Ethos v 1.0.10 or above
- USB cable for connecting to PC

2 OVERVIEW

2.1 FLIGHT MODES

There are five flight modes plus a special CAL mode.

Switch SA selects between CLIMB, NORMAL/REFLEX, or LANDING.

Switch SB selects between NORMAL and REFLEX

Pump mode is optional and disabled by default.

Flight Mode	SA	SB
NORMAL	Middle	↑ or middle
REFLEX	Middle	↓
LANDING	↑	
CLIMB (/PUMP)	↓	

2.2 MIXER TABLE

The table below shows the mixers in each flight mode.

FM	Diff *	Ail→ Rud	Ail→Flap	Crow brakes	Crow comp *	Snapflap *	Camber *	Reflex
Normal	✓	✓	✓			✓		
Climb	✓	✓	✓				✓	
Landing	✓	✓	✓	✓	✓			
Reflex	✓	✓	✓			✓		✓
Pump	✓	✓	✓			✓		

* adjustable in flight.

2.3 CONTROL ASSIGNMENTS

The default control assignments are as follows:

Control	Function
Throttle stick	Crow brakes
Rudder trim	Diff adjustment (per flight mode)
Throttle trim	Snapflap volume (PUMP, NORMAL, REFLEX modes) Crow compensation (LANDING mode)
Pot1	Snapflap expo adjust
Pot2	Camber preset adjust (CLIMB mode)
SC	Snapflap alerts on/off

Control assignments can be changed – see section 7.

2.4 CAL MODE

CAL mode is a special flight mode for calibrating the servo channels. When CAL is active, mixers and trims are ignored. To activate CAL mode:

1. Apply full left aileron and full up elevator, and hold.
2. Pull and release SH
3. Release sticks.
4. Select the CAL submode using switch SA:
 - SA—: for calibrating servo end points, and balancing the flaps. In this mode, the flaps move in 25% increments.
 - SA↓ for calibrating flap neutral.
 - SA↑ for calibrating with 50% aileron travel. The flaps move to their neutrals.

To exit CAL mode, pull SH.

2.5 PUMP MODE

PUMP mode is a special flight mode for pumping in F3F competitions. PUMP mode is disabled by default. For info on setting up, see section 7.3.

2.6 SERVO ASSIGNMENTS

Servos are assigned as follows:

Channel #	Vtail	Xtail
1	Right aileron	
2	Left aileron	
3	Right flap	
4	Left flap	
5	Right Vtail	Elevator
6	Left Vtail	Rudder
7-9	[free]	

The left and right channels are not interchangeable – *please ensure they are plugged in correctly!*

2.7 BASIC OPERATION

Rates and expo

- Rates/expo may be set globally or per flight mode.

Trims

- Aileron trim is global across all flight modes.
- Elevator trim is per flight mode.
- Rudder and throttle trims are repurposed (see below).

Camber and reflex

- In CLIMB mode, camber is adjustable via Pot2.
- In REFLEX mode, reflex is preset.

Aileron-to-flap mix

- Aileron-to-flap mixing may be set globally or per flight mode.

Crow->elevator compensation

- Crow compensation is adjustable during flight, via the throttle trim.
- The compensation curve can be adjusted.

Differential

- Diff is adjustable during flight, using the rudder trim.
- Diff settings are stored per flight mode.

Roll rate enhancement

- Aileron diff is suppressed, as crow is deployed.
- 'Reverse' diff can be configured to further lower the down-going aileron as crow is deployed.

Aileron to Rudder mix

- Aileron to rudder mix is global or per flight mode.

Snapflap

- Snapflap is available in NORMAL, REFLEX and PUMP modes.
- Snapflap volume is independent for each flight mode, and adjustable in flight via the throttle trim.
- Snapflap expo is adjustable via Pot1. Adjustment is global for all flight modes
- Audio alerts at 5% and 95% snapflap, to aid tuning. Enabled by switch SC.

Pump mode

- PUMP mode is optional, for 'pumping' during the 30-second climbout in an F3F comp.
- PUMP mode is disabled by default.

3 PREPARING THE TRANSMITTER

3.1 TRANSFER FILES TO TRANSMITTER

1. Unzip the files in the .zip package to your computer's hard drive.
2. Switch on the transmitter in bootloader mode and establish a USB connection.
3. Copy the model file **f3f-ethos_10?.bin** to the \models folder on the SD card.
4. Locate the .wav sound files, select all and copy to the \audio folder on the SD card. (Do NOT copy to the 'en' subfolder!)
5. Disconnect USB and restart the transmitter.

Activate the model as follows:

6. Go to the **MODEL SELECT** menu and find the model 'F3F-ethos_10?'.
7. Click and choose 'Set current model'.
8. Go to the **EDIT MODEL** menu, and change the name as desired.

3.2 HARDWARE CONFIGURATION

Now check that all the electronics are set up and ready.

1. The transmitter hardware must be properly calibrated, so do so now if in any doubt.
2. Configure the transmitter RF module.

3.3 FAMILIARISATION

Using the transmitter on its own, practice the following:

- Activate NORMAL, CLIMB, LANDING, and REFLEX modes (see Section 2.1).
- Activate CAL mode and sub-modes (see Section 2.4)
- Verify that the sounds are working correctly. If not, check that the sound files are in the correct location (see section 3.1).

4 CONFIGURE TAIL TYPE

Configure the tail type in the MIXERS menu.

Mixer	Description	Notes
59 V_IsVtail	Tail type	Weight = 0: X- or T-tail Weight = 1 (default): V-tail

5 CALIBRATE OUTPUTS

In this section, you will set the operating envelope of each servo – just enough to provide sufficient movement but without damaging your linkages. You'll also balance up the movements on the left and right sides. This section must be completed before configuring the mixers.

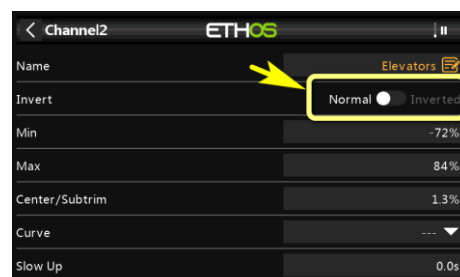
5.1 SET SERVO ROTATION

First set the rotation direction of the servos:

1. Switch on the transmitter (do not power up the receiver yet)
2. Set throttle stick to centre, Switch SA to middle
3. Enter CAL mode
4. Switch on the receiver
5. Open the **OUTPUTS** menu
6. While still in CAL mode, set the direction of control surfaces according to the table below. *Pay attention to the notes regarding aileron and elevator!*

Stick command	Control surface	Notes
Aileron stick right →	RtAil goes up ↑ LtAil goes up ↑	Ailerons move up together . This is to aid visual calibration later.
Thr stick forward ↑	RtFlap goes up ↑ LtFlap goes up ↑	
<i>V-TAIL only:</i> Ele stick forward ↑	RtVee goes up ↑ LtVee goes up ↑	In CAL mode, elevator operates in reverse direction to normal .
<i>X-TAIL only:</i> Ele stick forward ↑	Ele goes up ↑	
<i>X-TAIL only:</i> Rud stick right →	Rud goes right →	

To reverse a control surface, open the output editor, and change the *Invert* field from 'Normal' to 'Inverted'.



7. Exit CAL mode and enter NORMAL mode.
8. Move the aileron, elevator and rudder sticks, and for normal operation. **Note that the flaps will not function yet.**

5.2 ADJUST SERVO END POINTS AND CENTRES

In this section, you will (a) set the operating range of each servo and (b) compensate for linkage differences between the left and right sides. Note:

- All adjustments in CAL mode.
- Set servo limits to maximum possible - just a little less than the physical limits of the linkages and hinges.
- Adjustments are made using curves. **Do not alter min, max or Subtrim!**
- You may need to experiment to see which end of a curve to adjust, as explained in each note.

Channel	Calibration procedure
CH 4: LtFlap	<p>Start with left flap. In this step, you'll set the end points and servo centre. Do not worry about the flap neutral. it will be set later.</p> <ol style="list-style-type: none">1. Switch SA to middle2. Enter CAL mode3. In the OUTPUT menu, open CH4:LtFlap4. Skip to the 'curve' field, and open the curve editor<ul style="list-style-type: none"><input type="checkbox"/> Throttle stick back (↓), then adjust the absolute lower limit with curve point 1 or 3 (whichever works).<input type="checkbox"/> Throttle stick forward (↑), adjust absolute upper limit with point 3 (or 1).<input type="checkbox"/> Adjust point 2 so it's on the straight line through points 1 and 3.5. Move throttle stick from one end to the other, observing step intervals. If necessary, you can adjust point 2 to make the response more linear.
CH 3: RtFlap	<p>Next, calibrate the right flap. A 5-point curve is used, using the left flap as a reference.</p> <ol style="list-style-type: none">1. Enter CAL mode2. Switch SA to middle3. In the OUTPUT menu, open CH3:RtFlap4. Skip to the 'curve' field and open the curve editor. Adjust the points to exactly match the left flap. Note: <i>the order of the curve points may be reversed, if the first point doesn't work, try the alternative (in brackets).</i><ul style="list-style-type: none"><input type="checkbox"/> stick fully back, adjust point 1 (or 5) for the lower limit of travel.<input type="checkbox"/> stick ½-back, adjust point 2 (or 4)<input type="checkbox"/> stick to centre, adjust point 3.<input type="checkbox"/> stick to ½-forward, adjust point 4 (or 2)<input type="checkbox"/> stick fully forward, adjust point 5 (or 1) for the upper limit of travel <p>To match the end points on left and right sides, it may be necessary to go reduce one or other end points for the left flap in the previous step.</p> <p>Do a final check. Pay particular attention the points adjacent to flap neutral.</p>
Flap neutral	<p>Next, you'll set the flap neutral, by applying an offset mix.</p> <ol style="list-style-type: none">1. Open the MIXERS menu2. Scroll to mix 55V_FlapOffset3. Activate CAL mode4. Switch SA down.5. Listen for callout 'calibrate flap neutral'.6. Adjust <i>weight</i> for correct neutral. If the flaps are not perfectly in line with each other, then redo calibration for CH3:RtFlap above, paying particular attention to the two points adjacent to the neutral position.

Channel	Calibration procedure
<i>V-Tail</i> CH 5: RtVee CH 6: LtVee	Calibrate V-tail (applies to V-tail version only). 1. Enter CAL mode (position of SA is not critical.) 2. In the OUTPUT menu, open CH5:RtVee 3. Skip to the 'curve' field, and open curve editor <ul style="list-style-type: none"> <input type="checkbox"/> Ele stick to centre, adjust point 2 for correct neutral <input type="checkbox"/> Ele stick forward (↑), adjust end point 3 (or 1) for upper (↑) travel limit. <input type="checkbox"/> Ele stick back (↓), adjust point 1 (or 3) for lower (↓) limit. 4. Repeat for CH6:LtVee 5. Check equal travel up/down; left and right surfaces match
<i>X-Tail</i> CH 5:Elev	Calibrate elevator (applies to X-or T-tail only) 1. Enter CAL mode. (Position of SA is not critical.) 2. In the OUTPUT menu, highlight CH5:Elevator 3. Skip to 'curve' field, open curve editor <ul style="list-style-type: none"> <input type="checkbox"/> Ele stick to centre, adjust point 2 for correct neutral <input type="checkbox"/> Ele stick forward (↑), adjust point 1 (or 3) point for upper (↑) limit <input type="checkbox"/> Ele stick back (↓), adjust point 3 (or 1) for lower (↓) limit 4. Check travel is equal up & down
<i>X-Tail</i> CH 6:Rudd	Calibrate rudder (applies to X-or T- tail only) 1. Check you're still in cal mode (position of SA is not critical.) 2. In the OUTPUT menu, highlight CH6:Rudd 3. Skip to 'curve' field, open curve editor 4. Rudder stick to centre, adjust point 2 for neutral 5. Rudder right (→), adjust end point 1 (or 3) for right limit 6. Rudder left (←), adjust end point 3 (or 1) for left limit 7. Check equal travel left/right
CH 1:RtAil CH 2:LtAil	Finally, calibrate ailerons: 1. Enter CAL mode 2. Set switch SA to down position. The flaps will go to their calibrated neutrals. 3. In the OUTPUT menu, go to CH1:RtAil and open the curve editor <ul style="list-style-type: none"> <input type="checkbox"/> Aileron stick to centre. Set Point 2 for correct centre <input type="checkbox"/> Move aileron stick right (→). Set point 3 (or 1) for desired upper limit. <input type="checkbox"/> Move aileron stick left (←). Set point 1 (or 3) so that down-travel = up-travel. If down-travel is limited and you cannot complete this step, then move SA to the up position – this reduces aileron movement by 50% during calibration; retry the calibration remembering that you will get double the movement when you exit CAL mode. Don't worry if down-travel is excessive when you exit CAL – later adjustments to the aileron rate and diff will reduce it. 4. Repeat for CH2:LtAil 5. Check: constant rate up/down for each aileron, and check left and right ailerons match. Readjust if necessary.

Check operation as follows:

1. Exit CAL mode
2. Move the sticks, checking that aileron, elevator and rudder move in the correct sense. Note that **the flaps will not function yet** – they will be configured in the next section.
3. Don't worry that the travel of the ailerons and elevator are excessive – they'll be reduced in the next step.

WELL DONE! CALIBRATION IS COMPLETE – CLONE YOUR WORK NOW.

6 MIXER CONFIGURATION

In the final step, you'll set the control travel (rates) and mixers. Refer your plane's instructions for recommended settings. Most settings are via VAR mixes – these are grouped at the top of the mixer list.

6.1 RATES AND EXPO

This section is for setting rates (also known as 'control travel') and expo on the main flight controls.

Mixer	Adjusts	Notes
37 V_AilRates 38 V_EleRates 39 V_RudRates	Aileron/Ele/Rud rates.	Set the default rate by adjusting <i>weight</i> . Refer to the instructions for your model for the recommended travel. You can override the defaults for specific flight modes by adding extra weight lines, one per flight mode. To do this, <ol style="list-style-type: none">1. Click 'Add new weight'2. Click adjacent down arrow3. Select category 'Flight modes', and choose the flight mode4. Set the desired rate
40 V_AilExpo 41 V_EleExpo 42 V_RudExpo	Aileron/Ele/Rud expo.	Go to the <i>expo</i> field, and set the default expo. You can override the default expo by adding extra curve lines, one per flight mode. To do this: <ol style="list-style-type: none">1. Click 'Add new curve'2. Click adjacent down arrow3. Select category 'Flight modes', and choose the flight mode4. Set the desired expo

6.2 CROW BRAKES

This section is for setting up crow brakes.

Mixer	Adjusts	Notes
43 V_CrowtoAil	Crow to ailerons up	Adjust this mix for required aileron movement with crow. To configure: <ol style="list-style-type: none">5. Enter LANDING mode6. Pull the throttle stick fully back/down.7. Adjust <i>weight</i> for desired upward movement of ailerons
44 V_CrowToFlap	Crow to flaps down	-- <i>as above, for downward movement of flaps</i> --
45 V_CrowComp	Crow to elevator ('compensation')	This mix counteracts pitch changes due to crow. The amount is adjustable in flight using the throttle trim. To configure the maximum compensation: <ol style="list-style-type: none">1. Activate LANDING mode.2. Deploy full crow.3. Move throttle <i>trim</i> fully forward (for max compensation).4. Adjust <i>weight</i> for desired max compensation5. Move throttle trim back for desired operating compensation.
54 V_RevDiff	Reverse diff	In this step, you can adjust the travel of the down-going aileron when both full crow and full aileron are applied. This can improve roll response at full crow. To configure: <ol style="list-style-type: none">1. Activate LANDING mode2. Apply full crow and full aileron3. Adjust <i>weight</i> so that the down going aileron is a little below the neutral position. NOTE: this measure for improving roll response is in addition to the suppression of aileron diff as crow is deployed (this is done automatically).
56 V_AutoCrow	Enable Autocrow	See section 7.2

Adjusting pitch trim when crow brakes are deployed

In Landing mode, the total trim is the base trim (fixed) + compensation (variable). The procedure for adjustment is as follows:

1. Activate Landing mode and apply minimal crow. Adjust pitch with *elevator* trim. This sets the base trim.
2. Deploy *maximum* crow and use the *throttle* trim. This sets the compensation.

The compensation at mid-crow can then be adjusted with curve CV:CrowComp. Adjust points 2 to 4 only (do not adjust end points).

6.3 AILERON => FLAP

The aileron=>flap mix increases roll response.

Mixer	Adjusts	Notes
46 V_AilToFlap	Aileron to flap mix	Adjust <i>weight</i> to set the default aileron=>flap mix. Concentrate on the upward flap movement only (downward movement will be affected by the diff setting, adjusted with the rudder trim). You can over-ride the default for specific flight modes - same method as rates (see 6.1)

6.4 AILERON => RUDDER

Aileron => rudder is useful in landing mode, for improving turn response.

Mixer	Adjusts	Notes
47 V_AilToRud	Aileron to rudder mix	Adjust <i>weight</i> to set the default aileron=>rudder mix. You can over-ride the default for specific flight modes - same method as rates (see 6.1)

6.5 CAMBER

Configure maximum camber (Climb mode only)

Mixer	Adjusts	Notes
48 V_CambToAil	Aileron camber	Sets the maximum aileron camber. To configure, enter Climb mode, rotate Pot2 fully clockwise and adjust <i>weight</i> .
49 V_CambToFlp	Flap camber	-- as above, but for flaps --

6.6 REFLEX

Set the amount of reflex (Reflex mode only)

Mixer	Adjusts	Notes
50 V_RflxToAil	Aileron reflex	To configure the amount of aileron reflex, enter REFLEX mode and adjust mixer weight.
51 V_RflxToFlap	Flap reflex	-- as above, but for flaps --

6.7 ELEVATOR => AIL/FLAP ('SNAPFLAP')

Snapflap is adjustable in flight. Configure separately for ailerons and flaps.

Mixer	Adjusts	Notes
52 V_SnapToAil 53 V_SnapToFlap	Elevator to aileron ('Snapflap')	Snapflap is active in NORMAL, PUMP and REFLEX modes, and is adjustable in each mode independently using the throttle trim. First, configure the maximum possible snapflap (applies to all flight modes): <ol style="list-style-type: none">1. Enter NORMAL mode2. Move the throttle trim fully back (for max snapflap)3. Apply full up elevator4. Select mix V_SnapToAil and adjust <i>weight</i> for required max aileron movement.5. Repeat step 4, with V_SnapToFlap to adjust max flap movement. Finally, re-adjust the throttle trim for flight, for NORMAL, REFLEX and PUMP modes (if enabled)

Snapflap expo is adjustable via Pot1 - see section 7.6.

6.8 OTHER

Various other parameters.

Mixer	Adjusts	Notes
57 V_PumpMode	Enable PUMP mode	See section 7.3
58 V_TogglePump	Enable Toggle pump	See section 7.3
59 V_IsVtail	Tail type	0 = X- or T-tail 1 = V-tail
55 V_FlapOffset	Flap neutral offset	Adjusted in CAL mode

7 CUSTOMISING YOUR SETUP

This section describes the optional customisations. Your mixer settings etc. will not be affected so you can make these changes any time. Remember to make a backup first (an easy way is simply to 'clone' your setup from the MODEL SELECT menu).

7.1 SETTING THE LOW BATTERY ALARM

A low battery alarm is provided, and can be configured as follows:

1. Go to the SPECIAL FUNCTIONS menu
2. Open SF9
3. Set *State* to 'enabled' and set the interval between alerts.
4. Go to the LOGICAL SWITCHES menu, open LSW33:BAT_LOW.
5. Set *Value(X)* to the required threshold voltage.

The alert will be triggered when the voltage drops below the threshold for more than 3 seconds.

7.2 CONFIGURING 'AUTOCROW'

The Autocrow option allows LANDING mode to be activated simply by pulling on the crow stick – no need to engage a switch first. Many pilots prefer this style.

When Autocrow is enabled, the switch layout automatically changes:

- The previous Landing mode switch (default SA↑) is reassigned to Reflex mode
- The previous Reflex mode switch (default SB) is free for re-use.

Autocrow is enabled in the MIXERS menu as follows:

Option	Adjustment point	Values
AUTOCROW	CH56:V_AutoCrow→Weight	0: disabled (default) 1: enabled

7.3 CONFIGURING PUMP MODE

PUMP mode is an optional flight mode for 'pumping' in F3F competitions. You would typically set higher aileron and rudder rates, to provide greater control. Pump mode is disabled by default. With the PUMP option enabled, the PUMP flight mode is activated as follows:

1. Enter CLIMB mode
2. Pull SH↓

Pump mode is cancelled when another flight mode is active. Optionally, it can also be toggled on/off via SH↓.

Option	Adjustment point	Description
PUMP	CH57:V_PumpMode→Weight	Disable: 0 (default) Enable: 1
TOGGLE_PUMP	CH58:V_TogglePump→Weight	Allows PUMP mode to be toggled on/off using SH↓. Disable: 0 (default) Enable: 1

7.4 REASSIGNING FLIGHT MODE SWITCHES

Flight mode switches are assigned in logical switches LSW4 – LSW8.

Flight mode	Adjustment point	Default	Notes
Cal & Pump modes	LSW4	SH↓	Must be 2-pos momentary switch (safety!)
<i>Autocrow on</i> : Landing mode <i>Autocrow off</i> : Reflex mode	LSW5	SA↑	Specify a single 3-position switch, with a different position for each mode.
Normal/Reflex mode	LSW6	SA–	
Climb mode	LSW7	SA↓	
Reflex mode	LSW8	SB↓	Regular 2- or 3-pos switch.

7.5 CONFIGURING THE CROW STICK

The crow stick incorporates some deadband to prevent accidental deployment. The amount of deadband can be adjusted as follows:

1. Go to the Curves menu and open CV:ThrDB
2. Change Point2 → X. Default is 85.

To reverse the crow stick:

1. Open the mixer editor and highlight Mix:18Thr
2. Long press on source ('Throttle') and choose 'negative'. The source changes from 'Throttle' to '–Throttle'.

7.6 CONFIGURING THE SNAPFLAP EXPO ADJUSTER

By default snapflap expo is assigned to Pot1. You can assign it to a different control as follows:

1. Open the mixer editor for MIX: 20SnapExpo
2. Change the source as required.
3. To reverse the direction, long press on source, and choose 'negative'.

You can also disable the adjustment altogether. To do this, set the source to '---' (step 2). Expo will be fixed at zero and Pot1 can be re-assigned for other purposes.

7.7 CONFIGURING CAMBER PRESET ADJUSTER

By default the camber preset adjustment is assigned to Pot2. You can alter this as follows:

1. Open the mixer editor for MIX: 10Camb (for ailerons)
2. Change the source as required.
3. To reverse the direction of the control, long press on source, and choose 'negative'.
4. Repeat the steps above for MIX:11Camb (for flaps)

8 DISCLAIMER

Although this setup is tested, it's up to the pilot to make sure that the controls respond correctly under all conditions. The author will not be responsible for the consequences of any bugs in the setup or documentation or as the result of changes in Ethos.

***Remember to test your setup thoroughly before the
first flight and after any modifications!***

If in doubt, don't fly!!

If you have any queries or suggestions, or if you find any errors in the documentation, or just want to say hello, then please contact me at <http://rc-soar.com/email.htm>.

Safe flying!

Mike Shellim