F5K template for ETHOS

Version 2.0
for Ethos v1.5

Setup Guide

Mike Shellim
16 March 2024

F5K control layout (Mode 2 shown)

CONTENTS

1 INTRODUCTION

1.1 DESCRIPTION

F5K is a full-feature template for electric-powered gliders with flapperons (2 servos in the wing). Key mixers may be adjusted in flight and special attention has been paid to motor safety. The default target is the X18/X20 family of transmitters, but the layout can be easily customized for other transmitters.

PLEASE READ THROUGH THESE INSTRUCTIONS ONCE BEFORE STARTING - AND FOLLOW THE STEPS IN SEQUENCE

1.2 REQUIREMENTS

The following are required:

- Transmitter running Ethos 1.5.1 or above
- USB cable TX <-> PC

1.3 PACKAGE CONTENTS

Filename	Description
f5k-ethos_20_setupguide.pdf	Setup guide
f5k-ethos_20?_reference.xls	Programming reference
f5k-ethos_20?xy.bin	Model file
f5k*.wav	Sound files

2 OVERVIEW

2.1 CONTROL ASSIGNMENTS

Any stick mode (1-4) may be used (the stick mode is set in the *SYSTEM→STICKS* menu).
The default control assignments are shown in the table below. These are designed for the X18/X20. If you use a different transmitter, or prefer a different layout, then you can reassign the controls:

Assigned to	Default assignment	Switch type	Reassignment
THERMAL/SPEED/CRUISE selector	SA	3-pos	Section 7.1
LANDING	Throttle stick	Stick/slider or switch	Section 7.3
Motor	Slider left	Stick/slider or switch	Section 7.3
Camber (Thermal mode)	Slider right	Stick/slider or switch	Section 7.3
CAL mode	SH	Momentary	Section 7.2
CAL sub-mode selector	SA	2- or 3-pos	Section 7.4
Motor arming options 1, 2	SH	Momentary	Section 7.2
Motor arming option 3	SF	2-pos	Section 7.10
Aileron diff adjust	Rudder trim	Trim	n/a
Brake compensation adjust (LANDING mode) Motor compensation adjust (POWER mode)	Throttle trim	Trim	n/a

The text refers to the default assignments. If possible, it's recommended to delay reassigning the controls until the basic setup is complete.

2.2 FLIGHT MODES

There are 5 flight modes: POWER, LANDING, THERMAL, CRUISE and SPEED. In the event of a conflict, POWER has highest priority, then LANDING, then THERMAL/ CRUISE/SPEED.

Flight Mode	Ethos ID	Activated by	Priority
POWER	FM2	Slider left↑ (motor must be armed)	**High**
LANDING	FM3	Throttle stick ↓	**Mid**
CRUISE	FM4	SA —	Low
SPEED	FM5	SA ↑	Low
THERMAL	D	SA ↓	Low

2.3 FM/MIXER MATRIX

The table shows the mixers which are active in each flight mode.

Flight mode	Diff*	Motor Compensation*	Brake compensation*	Ail→ Rud	Variable camber	Camber preset	Snapflap
POWER	✓ (Rud trim)	✓ (Thr trim)		✓		✓	
LANDING	✓ (Rud trim)		✓ (Thr trim)	✓		✓	
CRUISE	✓ (Rud trim)			✓		✓	✓
SPEED	✓ (Rud trim)			✓		✓	✓
THERMAL	✓ (Rud trim)			✓	✓		✓

* adjustable in flight.

2.4 CAL MODE

CAL mode is a special flight mode for calibrating the servos. Mixers and trims are ignored, allowing the servo centre and limits to be visualised.

To activate CAL mode:

1. Apply full left aileron and full up elevator, and hold.
2. Pull and release **SH**
3. Release sticks.

There are two sub-modes, selected via switch **SA**:
- **SA↑**, **SA—**: for calibrating end points, and balancing the ailerons. The ailerons move in 25% increments.
- **SA↓** for calibrating aileron neutral.

To exit CAL mode, pull **SH↓**.

2.5 CHANNEL ASSIGNMENTS

Channel assignments are as follows:

Channel #	Xtail	Vtail
1	Rudder	Left Vtail
2	Elevator	Right Vtail
3	Left aileron	
4	Right aileron	
5	Motor	

The left and right channels are not interchangeable – **please make sure your servos are plugged in correctly!**
Note: 'Left' and 'right' are from the point of view of an observer looking in the direction of flight.

2.6 OPERATIONAL OVERVIEW

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 independent in each flight mode.
- Rudder and throttle trims are repurposed (see below).

Camber

- In THERMAL mode, camber is controlled via the right slider
- In SPEED, CRUISE and POWER modes, camber may be preset.
- Negative camber ('reflex') is supported

Brake->elevator compensation

- A variable mix which compensates for pitch changes as brake is deployed.
- Adjustable in flight, via the throttle trim.
- Non-linear compensation may be adjusted via a curve

Motor->elevator compensation

- Variable mix which compensates for pitch changes as power is applied.
- Adjustable in flight, via the throttle trim.

Aileron differential

- Aileron diff is adjustable independently per flight mode, using the rudder trim.

Aileron to Rudder mix

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

Elevator-to-flap ('snapflap')

- Snapflap is configurable per flight mode. Up- and down-snapflap are set independently.

2.7 MOTOR OPERATION

The default method of arming the motor is as follows:

1. Motor lever to idle (**left slider↓**).
2. Apply full right-aileron and full up-elevator, and hold.
3. Pull **SH** and hold for 1 second until the startup sound.
4. Release **SH.**
5. Release stick(s).

The motor is now active. To disarm the motor, pull **SH** for 1 second until you hear the 'motor disarmed' alert.

Power mode

POWER mode is activated automatically when the motor is running. This allows you to set different rates, expo etc. when under power.

Failsafe

> ⚐ **The arming system does not protect against signal loss. Remember to set the failsafe, so the motor is commanded to 'off' (-100) on loss of signal.**

2.8 Timer

Timer1 is configured as an automatic flight timer.

- To reset: arm the motor.
- To start: advance motor.
- To stop: disarm the motor.

The elapsed time is announced when the timer stops.

3 Preparing the transmitter

| ☠ **SAFETY: disconnect the motor before proceeding !!** |

3.1 Transfer files to transmitter

1. Unzip the files in the 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 **f5k-20?xy.bin** to the \models folder on the SD card.
4. Copy all the sound (.wav) files to the audio sub-folder for **voice1**. To determine the sub-folder for voice1, go to the *SYSTEM>GENERAL* menu ('Audio' section).
5. Disconnect USB and restart the transmitter.

Activate the model as follows:

6. Go to the *MODEL SELECT* menu and find the model 'f5k-20?'.
7. Click and choose 'Set current model'.
8. Go to the *EDIT MODEL* menu and change the model name as desired.

3.2 Choose the tail type (X- or V-tail)

The first task is to select the tail type (conventional or V-tail). This is done in the *VARS* menu, via the *values* parameter (new in Ethos 1.5).

VAR	Description	Values
V_IsVtail	Tail type	0% = X- or T-tail (default)
		>0% = V-tail

3.3 Configure the hardware

Configure the hardware:

1. Do a hardware stick calibration if in any doubt (*SYSTEM→HARDWARE→ANALOGS CALIBRATION*).
2. Configure the transmitter RF module (*MODEL→RF SYSTEM*).

3.4 Familiarisation

Using the transmitter on its own, practise the following:

- Activate CRUISE, THERMAL, LANDING, POWER and SPEED modes (see Section 2.2).
- Activate CAL mode and sub-modes (see Section 2.4).
- Verify that the sounds work when changing flight modes. If not, check that the sound files are in the correct location (see section 3.1).

4   CALIBRATE SERVOS

In this section, you will

- Set servo directions.
- Calibrate servo limits.
- Equalise left and right sides (compensate for mechanical differences).

This section must be completed before configuring the mixers.

4.1   SET SERVO DIRECTION

Before starting, make sure that you selected the correct tail type (see section 3.2).

Now, set the servo rotation:

1. Switch on the transmitter and receiver
2. Move the aileron stick
3. If a servo moves in the wrong direction, open the OUTPUTS menu, and invert the channel:
4. Repeat steps above for elevator and rudder

Note: the throttle stick (for brakes) has no effect at this stage.
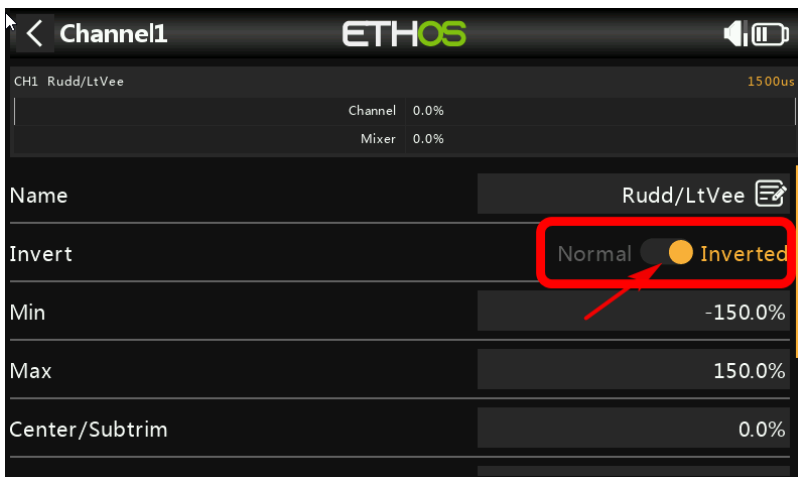
4.2 SET SERVO LIMITS AND CENTRES

In this section, you will (a) set the servo centres and limits and (b) equalise left/right control surface movements.
Note:

- All adjustments are made in CAL mode.
- Set servo limits to *maximum possible* as limited by mechanical constraints. Don't worry about individual control travels, the goal is to define the max operating range of the servos.
- Adjustments are made using curves. **Do not alter min, max or Subtrim!**
- You may need to experiment to see which point to adjust, as explained in each note.

Note: **in CAL mode the aileron stick does not function.**

Target	Calibration procedure
X-Tail **CH 1:Rudd**	***For X/T tail only*** 1. Enter *CAL* mode 2. In the ***OUTPUT*** menu, highlight CH1:Rudd/LtVee 3. Skip to 'curve' field, open curve editor ☐ Rudder stick to centre, adjust point 2 for correct neutral ☐ Rudder right (→), adjust end point 1 (or 3) for right limit ☐ Rudder left (←), adjust end point 3 (or 1) for left limit 4. Equalise movement left and right
X-Tail **CH 2:Elev**	***For X/T tail only*** *Note*: **in CAL mode, the elevator stick is reversed!** 1. Enter CAL mode 2. In the ***OUTPUT*** menu, highlight CH2:Elev/RtVee 3. Skip to 'curve' field, open curve editor ☐ Ele stick to centre, adjust point 2 for correct neutral ☐ Ele stick forward (↑), adjust point 1 (or 3) point for **upper** (↑) limit ☐ Ele stick back (↓), adjust point 3 (or 1) for **lower** (↓) limit 4. Check travel is equal up & down, reduce one or other limit if necessary.
V-Tail **CH 1: LtVee** **CH 2: RtVee**	***For V-tail only*** *Note*: **in CAL mode, the elevator stick is reversed!** 1. Enter CAL mode 2. In the ***OUTPUT*** menu, open CH1:Rudd/LtVee 3. Skip to the 'curve' field, and open curve editor ☐ Ele stick to centre, adjust point 2 for correct neutral ☐ Ele stick forward (↑), adjust end point 3 (or 1) for **upper** (↑) travel limit. ☐ Ele stick back (↓), adjust point 1 (or 3) for **lower** (↓) limit. 4. Repeat for CH2:RtVee 5. Check equal travel up/down and that left/right surfaces match

Target	Calibration procedure

CH 3: LtAil	Set the end points and centre for the left aileron servo.
	1. Enter CAL mode
	2. Switch **SA** up ↑
	3. In the *OUTPUT* menu, open CH3:LtAil
	4. Skip to the 'curve' field, and open the curve editor
	
	    1. Throttle stick back (↓), then adjust the absolute lower limit with curve point 1 or 3 (whichever works).
	    2. Throttle stick forward (↑), adjust absolute upper limit with point 3 (or 1).
	    3. Adjust point 2 so it's on the straight line through points 1 and 3. *Do not worry about the aileron neutral position, it will be set later via a mix.*
	
	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 4: RtAil	Next, calibrate the right aileron. A 5-point curve is used, using the left aileron as a reference.
	1. Enter CAL mode
	2. Switch **SA** up ↑
	3. In the **OUTPUT** menu, open CH4:RtAil
	4. Skip to the 'curve' field and open the curve editor. Adjust the points to exactly match the left ail. Note: *the order of the curve points may be reversed, if the first point doesn't work, try the alternative (in brackets).*
	
	    ☐ Throttle stick fully back, adjust point 1 (or 5) for the lower limit of travel.
	    ☐ stick ½-back, adjust point 2 (or 4)
	    ☐ stick to centre, adjust point 3.
	    ☐ stick to ½-forward, adjust point 4 (or 2)
	    ☐ stick fully forward, adjust point 5 (or 1) for the upper limit of travel
	
	To match the end points on left and right sides, it may be necessary to adjust the end points for the CH3:LtAil (see previous step).
	Do a final check. Pay particular attention the points adjacent to ail neutral.

Aileron neutral	Next, you'll set the aileron neutral position, by applying an offset mix. 1. Enter CAL mode 2. Switch **SA** down ↓, and listen for 'calibrate flap neutral'. 3. Open the *VARS* menu 4. Scroll to mix V_AilNeutral 5. Adjust *Values* field for correct neutral. The ailerons should line up precisely with each other. If not, then redo the calibration for CH4:RtAil above, paying particular attention to the two points adjacent to the neutral position.

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 brake stick does not function yet** – it 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.
4. Don't worry that up/down travel of the ailerons is not equal when out of CAL – they are now subject to differential (adjusted using the rudder trim).

Well done - calibration is complete! please back up your setup now!

5 CONFIGURING RATES AND MIXERS

In the final step, you will finalise the stick rates, and configure the mixers.

Most adjustments are via the *VARs* menu (new in Ethos 1.5). *Tip:* Make sure to adjust the number in the *Values* field only, not the *Range* field (it's easy to mix up the two).

5.1 RATES (TRAVEL)

Control surface travel is set in these VARs:

- **V_AilRates** – for aileron rate. Upward movement only (down movement is adjusted via Diff).
- **V_EleRates** – for elevator rate
- **V_RudRates** - for rudder rate

Open the VAR editor, and set the default rate in the first line. Extra lines may be added for FM-specific rates.

To add a line, click on the 'add' icon, and choose category 'Flight modes'. Then select the flight mode.

SAFETY: *always ensure that the default rate provides sufficient control.* **Never set it to zero!**
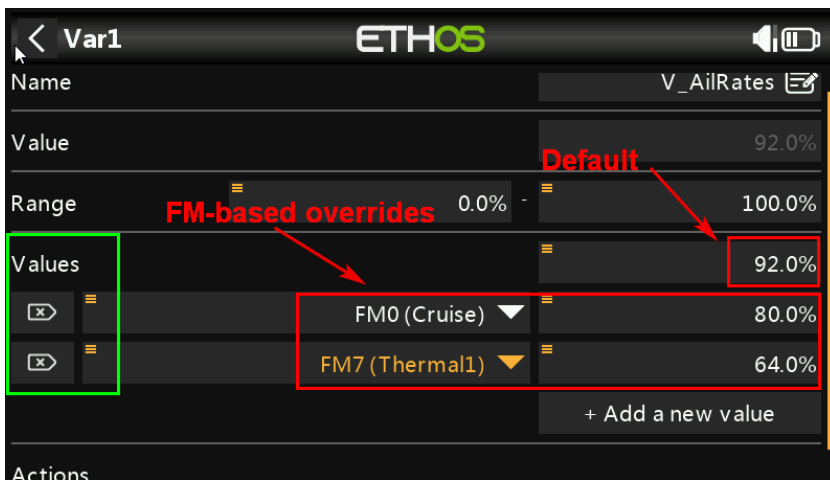
5.2 EXPO

Expo is adjusted in the following VAR mixes:

- **V_AilExpo** – for aileron expo
- **V_EleExpo** – for elevator expo
- **V_RudExpo** – for rudder expo

The first value is the default. Add flight mode specific values as for Rates.

5.3 AILERON DIFF

Aileron differential ('diff') determines the relative amount of aileron down travel (compared with up-travel). The more diff, the less down travel.

Diff is adjustable in flight using the rudder trim:

- Trim fully left = 70% diff (down-travel = 30% of up-travel)
- Trim centre: 20% diff (down-travel = 80% of up-travel)
- Trim full right: −30% diff (down travel = 130% of up-travel)

The adjustment is flight mode dependent - *remember to adjust diff for each flight mode!*

5.4 BRAKES CONFIGURATION

5.4.1 Brake Travel

The downward aileron travel due to brakes is adjusted in VAR **V_BrakeToAil**. To set, enter LANDING MODE, then deploy full brakes by pulling full back on the throttle stick. Finally, adjust the VAR.

5.4.2 Brake => Elevator ('compensation')

The elevator compensation mix adds down trim as brakes are deployed. The mix is adjustable using throttle trim, varying from zero (trim fully back) to the maximum as set in **V_BrakeComp** (trim fully forward). The default maximum is 50% of available down-elevator travel and is normally sufficient.

To increase the max compensation, apply full brakes and move the throttle *trim* fully forward, then set the VAR for required elevator movement.

5.5 AILERON => RUDDER

This aileron=>rudder mix can help with turns, and is especially useful with brakes deployed in LANDING mode. Adjust in VAR **V_AilToRud,** in the same manner as Rates (section 5.1).

5.6 CAMBER SETTINGS

5.6.1 Variable camber

In THERMAL mode, camber is variable. Use the right slider to adjust. The minimum camber is 1/3 of the maximum. For example, if max camber is 6 degrees (slider back), the minimum camber will be 2 degrees (slider forward).

To set the maximum camber, enter THERMAL mode, move the slider back, and adjust VAR **V_CmbMaxThml**.

5.6.2 Preset camber/reflex

Preset camber can be set for SPEED, CRUISE, LANDING and POWER modes. To set a preset, first activate the target flight mode, then edit the corresponding line in VAR **V_CmbPresets**.

Tips:
In SPEED mode, dial in some negative camber ('reflex').
In LANDING mode, the camber you set it is the base camber before brakes are applied. You would typically set this to match the camber in THERMAL or CRUISE modes, in order to achieve a smooth transition.

5.7 ELE => FLAP ('SNAPFLAP')

Snapflap settings for up- and down-elevator are independently adjustable, per flight mode (CRUISE, SPEED, THERMAL).

VAR	Adjusts	Notes
V_SnapUpEle	Snapflap with up-elevator	To adjust: 1. Apply full *up* elevator (stick fully back) 2. Adjust weight for desired *down*-aileron travel. 3. Repeat for each applicable flight mode.
V_SnapDnEle	Snapflap with down-elevator	To adjust: 1. Apply *down* elevator (stick fully forward) 2. Adjust weight for desired *up*-aileron travel 3. Repeat for each applicable flight mode.
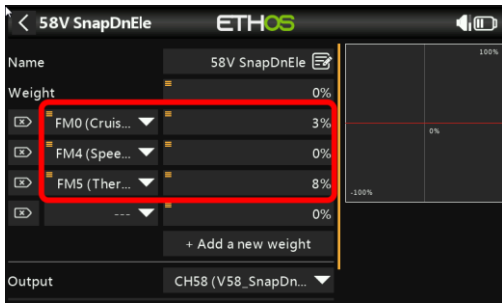
Snapflap deadband is adjustable in curve CV:SnapDeadB (adjust points 2 and 3 only).

5.8 MOTOR TO ELEVATOR ('MOTOR COMPENSATION')

This mix is to counteract trim changes due to motor thrust. It's adjustable using throttle trim. The amount of compensation varies from zero (trim in centre) to +/- the amount set in **V_MotorComp** (trim at one or other limit). By default the maximum is +/-50% of available down-elevator travel and is normally sufficient.

SAFTEY: disconnect the motor before adjustment.

6 THE FIRST FLIGHT

6.1 PRE-FLIGHT SAFETY CHECKS

Before the first flight, check the motor channel system:

1. Disconnect the motor and go to the *OUTPUTS* menu.
2. Move motor control to Off, and check that CH5 is -100%.
3. Move motor control to full power, and check that CH5 is +100%
4. Set the motor compensation to zero (enter POWER mode, then move the throttle trim to the centre).

6.2 ADJUSTING BRAKE AND MOTOR COMPENSATION

6.2.1 Brake compensation

To adjust brake compensation during test flights:

1. Activate LANDING mode.
2. Apply *minimal* brake, and adjust **elevator** trim lever. This adjusts the 'base' trim.
3. Apply *maximum* brake and adjust the **throttle** trim. This adjusts the compensation.
   Note: Zero compensation is with **trim fully back**.

Once the maximum compensation has been adjusted, you can fine tune the intermediate values via curve CV:BrakeComp. Adjust points 2 to 4 only (do not adjust end points). The default curve has a typical 'S' shape.
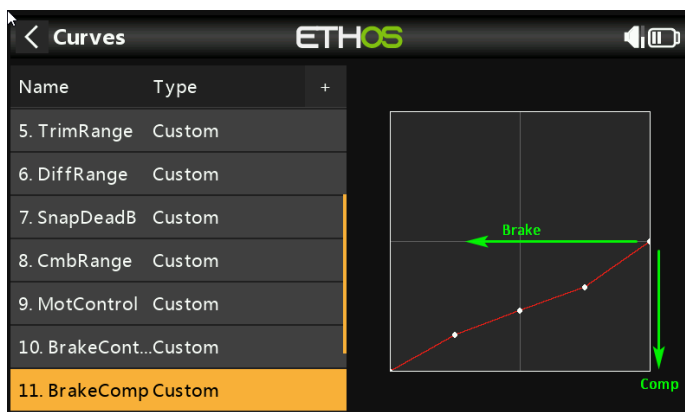
6.2.2   Motor compensation

Optimise the trim under power as follows:

1. Apply minimal power, and adjust **elevator** trim. This sets the 'base' trim.
2. Apply full power and adjust **throttle** trim for level flight.
   Note: Zero compensation is with the **trim in the centre**.

6.3   SUMMARY OF IN-FLIGHT ADJUSTERS

Here's a summary of the adjustments that you can make in flight. Take a note and keep it in with your model.

Trim	Flight mode	Adjusts	Notes
Rudder trim	[Any]	Aileron Diff	Diff is set per flight mode, Default range is −30% to +70%. Trim centre corresponds to 20% diff
Throttle trim	Landing	Brake=>Ele compensation	Zero brake comp is with throttle trim *fully back*.
	Power	Motor=>Ele compensation	Zero motor comp is with throttle trim in *centre*.
Aileron trim	[All]	Aileron Trim	Aileron trim is global across all flight modes.
Elevator trim	[Any]	Elevator trim	Elevator trim is stored per flight mode.

7   CUSTOMISING YOUR SETUP

This section describes optional customisations. You can make these changes at any time. Before making changes, backup your setup (clone it from the ***MODEL SELECT*** menu).

7.1   REASSIGNING THE MAIN FLIGHT MODE SWITCH

The default mode switch is SA. However you can specify another 3-position switch:
Go to the ***FLIGHT MODES*** menu, then:

1. Set the switch for SPEED mode (3 pos switch, any position)
2. Set the switch for THERMAL mode (same switch as above, but different position)

CRUISE will be selected with the switch in the third (unassigned) position.

7.2   RE-ASSIGNING THE MOMENTARY SWITCH

Momentary switches ***must*** be used for (a) CAL mode and (b) for motor arming. By default, both are assigned to SH↓, however you can reassign them to other momentary buttons if your radio allows (for example the X20 has momentary buttons SI and SJ). To reassign these functions:

1. Go to the ***LOGICAL*** Switches screen.
   - To reassign the CAL mode switch, edit LSW1:SW_MOM_CAL
   - To reassign the motor arming switch, edit LSW3:SW_ ARM_12
2. Set *Value1* to your chosen momentary switch (select the *down* position).

7.3 Reassigning Brake, Motor and Camber Controls

Brake, motor and camber may be reassigned to any suitable control. Go the *Mixers* menu, highlight the relevant mix (see table below), and open the mixer editor. Then change the source to a spare control of your choice.

Function	Assign to	Mixer	Default
Brake	Throttle stick, slider, or 3p switch	*Mixers* → **17BrakeCtrl** → source	Throttle stick
Motor	Throttle stick, slider, or 3p switch	*Mixers* → **18ThrotCtrl** → source	Left slider
Camber	Throttle stick, slider, or 3p switch	*Mixers* → **20VariCamber** → source	Right slider

7.4 Reversing Brake, Motor and Camber Controls

To reverse any of these controls, go to the *Mixers* menu, highlight the relevant mixer (as shown in the table above), and open the mixer editor. Highlight the source field, then long press {Enter}. A popup for the options will be displayed – long press/click and choose 'negative'.

7.5 Reassigning the CAL sub-mode switch

The CAL submode switch (see section 2.4) is **SA↓** by default. It can be reassigned to any 2- or 3-position switch.

1. Go to the *Logical Switches* menu
2. In logical switch SW_CAL_NEUTRAL, set *value1* to the desired switch.

7.6 Adjusting Brake Stick Deadband

The brake stick response incorporates some deadband at the idle end to help prevent accidental deployment. The default value should be fine for most pilots; however it can be adjusted as follows:

1. Go to *Curves* menu.
2. Open CV:BrakeControl.
3. Adjust point2→X. Default value is 85% (approx. 2 teeth on the throttle ratchet).

7.7 Adjusting Motor Control Deadband

The motor control incorporates some deadband at the idle end to help prevent accidental deployment. The default value should be fine for most pilots; however it can be adjusted as follows:

1. Go to *Curves* menu.
2. Open CV:MotControl.

Adjust point2→X. Default value is -75%.

7.8 Setting the low battery alarm

The low battery alert is disabled by default. When enabled, it sounds a "receiver battery low" alert every 3 seconds, as long as the voltage is below a configurable threshold.

To configure and activate the low battery alarm:

1. Go to the *Logical Switches* menu, open LSW41:RXBAT_LOW.
2. Set the source to 'LiPo' or 'RxBatt' as required (you may need to discover sensors)
3. Set *Value(X)* to threshold voltage.
4. Go to the *Special Functions* menu, open SF14 (Play Track RXBAT_LOW).
5. Set *State* to 'enable' and set the repeat interval.

7.9 SUPPRESSING 'MOTOR ARMED' ALERTS

By default, an alert is sounded every 15 seconds when the motor is armed but not running. If you're confident with motor operation, you can suppress the repeats. To do this:

- Go to the Special Functions menu
- Locate SF10 (condition = 'ARMED_NOT_RUN')
- Press {long enter} to open the editor
- Set state to 'disable'.

The alert will now sound once only, when the motor is armed.

7.10 SELECTING THE ARMING METHOD

You can choose between three arming methods as follows:

Method 1(default): Push stick in corner and pull momentary.

This method is the default.
To arm: motor lever off. Full back on elevator stick, full right aileron, pull **SH↓** and hold until confirmation.
To disarm: pull **SH↓** until confirmation.

Settings:

- LS3 - Value1= momentary switch (default **SH↓**). *Note:* Must be momentary *not a regular switch (safety)!*
- LS5 - Value1 = ARM_GEST_1
- LS6 - Value1 = DISARM_GEST_1

Method 2: Pull momentary switch

This method is secure, and better suited if you need to disarm and re-arm in flight.
To arm: motor lever off. Pull **SH↓** until arming confirmation
To disarm: pull **SH ↓** until disarming confirmation

Settings:

- LS3 - Value1= momentary switch (default **SH↓**). Must be momentary *not a regular switch (safety)!*
- LS5 - Value1 = ARM_GEST_2
- LS6 - Value1 = DISARM_GEST_2

Method 3: Smart switch

This method uses a smart switch. It offers fastest arming/disarming. At startup, the motor will be disarmed regardless of the position of the switch, so switch checks are not required. *This method is inherently less secure than methods 1 and 2, and is for experienced flyers.*

To arm: motor lever at idle position, then **SF↓** (if SF is down at startup, move switch up then down).
To disarm: **SF↑**

Settings:

- LS4 - Value1= 2-p or 3-p switch (default is **SF↓**)
- LS5 - Value1 = ARM_GEST_3
- LS6 - Value1 = DISARM_GEST_3

8   MAKING YOUR OWN MODIFICATIONS

If you wish to make your own modifications, please study the Excel documentation carefully and make sure that you understand the implications of any changes. Recommended workflow as follows:

1. Setup your model as described in this manual.
2. Backup your work.
3. Apply your modifications incrementally, testing and backing up as you go along.

9   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