F3F Setup

for FrSky Taranis

Version 3.1

Setup Guide

Mike Shellim
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1 Introduction

The FrSky Taranis is a fine radio for RC sailplanes. However creating your perfect setup can be daunting if you don't have the necessary skills in OpenTx. *F3F Setup for Taranis* enables pilots to enjoy a competition-proven setup - without the hassle of programming from scratch.

The setup offers a simple interface for F3F racing. In addition, spare controls are used to adjust key mixes, allowing rapid progress to race-ready trim.

Application
- Supports 6-servo gliders
- V-tail and X-tail versions
- For all stick modes

Flight modes
- Normal, Climb, and Landing
- Reflex option for Normal flight mode
- Voice confirmation
- Switch customisations *[new in v3.1]*

In-flight adjustments
- adjuster for snapflap volume
- adjuster for snapflap expo
- adjuster for aileron diff
- adjuster for camber preset
- adjuster for spoiler-to-elevator compensation

Spoiler functions
- Aileron differential suppression
- Reverse Diff
- Spoiler/elev compensation with multi-point curve
- Optional 'instant spoiler' mode *[new in v3.1]*
- Adjustable spoiler deadband *[new in v3.1]*

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

Misc
- Channels 7-9 free for motor etc.

2 Contents of ZIP package

The contents of ZIP package are as follows:

Filename	Description
F3F_v31_userguide.pdf	this document
F3F_v31_reference.xls	settings reference
F3F_v31x_setup.eepe	EEPROM image, contains versions: 'X' for cross- and T-tail, 'V' for V-tail
anormal.wav	Sound files for flight modes
areflex.wav	
acal.wav	
alanding.wav	
aclimb.wav	

3 Requirements

The following will be required before installing the setup:
- X9D or X9E transmitter + OpenTx (see web page for supported versions of OpenTx)
- USB cable for connecting the transmitter to your PC
- OpenTx Companion on your PC, for transferring models between tx and computer
- A basic familiarity with OpenTx's menu navigation and data entry

4 Overview of setup

4.1 Flight modes

Four flight modes are provided for Climb, Normal, Reflex and Landing.
SA is the main flight mode switch, for selecting Climb, Normal/Reflex, or Landing.
SB selects Normal or Reflex when SA is in middle position.

SA	SB	Flight Mode	Mixers active
↑		LANDING (FM2)	Spoiler
-	↑	NORMAL (FM0)	Snapflap
	↓	REFLEX (FM4)	Snapflap, Reflex
↓		CLIMB (FM3)	Camber

4.2 Control assignments

Rudder, Elevator, Spoiler and Throttle (Spoiler) are assigned according to the stick mode in Model Setup menu. Secondary controls are as follows:

Control	Function
Rudder trim	Diff
Throttle trim	Snapflap volume (NORMAL & REFLEX modes) Spoiler compensation (LANDING mode)
Rotary knob S1 (X9D), F1 (X9E)	Snapflap expo (NORMAL & REFLEX modes)
Rotary knob S2 (X9D), F2 (X9E)	Camber (CLIMB mode)
Switch SF	Backlight

4.3 Servo channel assignments

The default assignments 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	[free]	
8	[free]	
9	[free]	

The order can be altered by moving the relevant mixers and servo definitions. If you're not confident then please contact the author for a custom setup.

4.4 'Calibration' mode

A special flight mode named 'CAL' is provided to aid setting up servo limits and centres. When CAL is activated, all mixers and trims are disabled. This allows servo centres and limits to be visualised during adjustment. To enable CAL:

1. Apply full left aileron and full up elevator
2. Press SH
3. Release SH
4. Release sticks

Once in CAL mode, a chirp sounds every 5 seconds. To exit CAL mode, press SH again.

5 Setting up the radio

Adjustments should be made in the sequence shown. Tick boxes are provided for recording your progress.

5.1 Preparation

- ☐ Copy the flight mode sound (.WAV) files to the /SOUNDS/[lang] folder of the SD card.
- ☐ Launch OpenTx Companion on your PC, then
  - ☐ Open the provided F3F EEPROM file (F3F_v30x_setup.eepe)
  - ☐ Open your transmitter's EEPROM ("Read Models and Settings from Radio")
  - ☐ Select the V- or X-tail setup from the F3F EEPROM, and drag to your transmitter's EEPROM.
  - ☐ Right click on chosen model in the transmitter EEPROM, and make it the default.
  - ☐ Close the F3F EEPROM, leaving just your transmitter's EEPROM open
  - ☐ Write the tx EEPROM back to your transmitter ("Write Models and Settings to Radio", leave 'patch' options unchecked).
- ☐ IMPORTANT: on your transmitter, perform a hardware stick calibration now. (Splashscreen->MENU long press→CALIBRATION).
- ☐ Using the transmitter, familiarise yourself with the main flight modes (see §4.1) and CAL mode (§4.4). Check that the flight mode sounds are working correctly. If sounds are not working, then make sure that you copied the sound files to the correct location.

5.2 First task: calibrating the flaps

We'll start by calibrating the flap servos, i.e. setting the direction, centre and end points of each servo. The aim is to (a) limit servo travel to avoid damaging the linkages and (b) equalise movements on the left and right sides of the model. We'll use the special 'CAL' flight mode for most of the steps.

If you follow the steps to the letter you'll be rewarded with a perfectly symmetrical setup which will make you the envy of your Futaba and JR toting friends!

5.2.1 Set rotation of flap servos

The first task is to set the direction of rotation:

- ☐ Switch on the transmitter (don't switch on the receiver just yet).
- ☐ Enable CAL flight mode. The tx should chirp every five seconds.
- ☐ Move throttle stick to centre.
- ☐ Switch on the receiver. The flaps will probably settle at between neutral and 30 degrees down.
- ☐ Enter the SERVOS menu.
- ☐ Check direction of flap servos: As you move the throttle stick **forwards,** both flaps should move **up**.
- ☐ If either flap moves down, then reverse the servo by highlighting the *Direction* column and pressing the Enter key once (be careful not to press it twice otherwise the setting will revert). NOTE: Ignore any "INVERT THROTTLE" warning.

5.2.2 Left flap calibration

Now calibrate **left flap**. The goal of this step is to set the servo end points and centre.

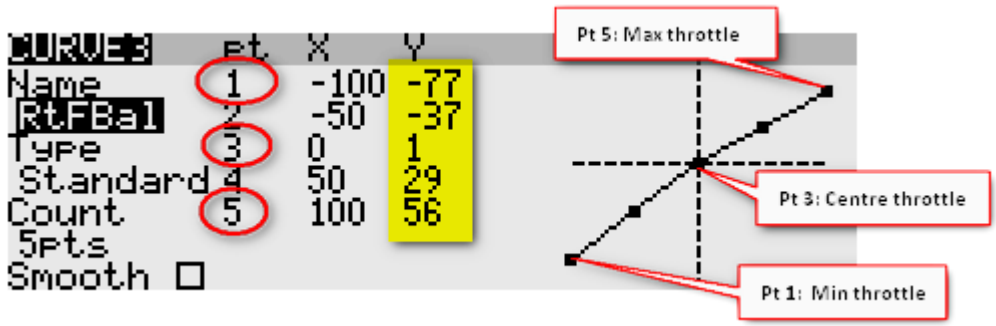
- ☐ Highlight the **LtFlap** line
- ☐ Move the throttle stick fully **forward**. The left flap will move **up**.
- ☐ Adjust *Max* until the linkage just starts to bind, then back off a little.
- ☐ Move the throttle stick fully **back.** The left flap will move **down**.
- ☐ Adjust *Min* until the linkage just starts to bind, then back off a little.
- ☐ Move the throttle stick forwards and back. The movement of the left flap will probably be non-linear as the stick is moved. We'll fix that in the next two steps.
- ☐ Now set Subtrim for the **left flap only**. This adjustment is done without visualising - simply set *Subtrim* midway between *Min* and *Max*, i.e. *Subtrim = (Min + Max)/2.*
  Example: if *Min* = –80 and *Max*=20, then set *Subtrim* = (–80 + 20)/2 = –60/2 = –**30**
- ☐ Starting with the throttle stick in the centre, move to one end point. Repeat to the other end point. The flap travel should be approximately equal each side. If it's severely unequal, readjust Subtrim so that you get approximately equal movement each side of stick centre.

5.2.3 Right flap calibration

For the **right flap**, we'll calibrate using a 5-point curve to match the response with the left flap.

- ☐ Check that you're still in CAL mode, re-enter CAL mode if not.
- ☐ In the Servos menu, Highlight the **RtFlap** line.
- ☐ Leave *Min*, *Max* and *Subtrim* at the defaults values (-100, 0, +100)
- ☐ Skip to '**CV3'** and Press ***long Enter***. The curve dialog will open. Adjust points as follows:
  - move throttle **back**, adjust point **1** to match left flap exactly:
  - move throttle to **25%**, adjust point **2**
  - move throttle to **centre**, adjust point **3**
  - move throttle to **75%** pos, adjust points **4**.
  - move throttle **forward**, adjust point **5**

  NOTE: to get flaps to match at extremes (points **1** & **5**), it may be necessary to reduce one or other end points for the left flap (see §5.2.2).



- ☐ The flaps should now match perfectly throughout the range of throttle stick travel. Check now. Don't worry that the flap neutral is 'floating', we'll fix that in the next section.
- ☐ Exit CAL mode.

5.3 Finalising the flaps

OK, it's time to (a) adjust the spoiler movement and (b) adjust the flap neutral. For this task, we'll leave calibration mode and make some mixer adjustments.

- ☐ Exit CAL mode
- ☐ Select Landing mode
- ☐ Enter the MIXER menu and Scroll down to CH11 (FlapCm).
- ☐ Highlight the 'Spoiler' input, and open the mixer editor
- ☐ In the mixer editor, the *wt* parameter sets the spoiler travel. Start with say 80%. (Don't worry about over-driving the servos - you've already calibrated the servos so they'll stop dead before doing any damage.)
- ☐ Still in the mixer editor, push the throttle stick **fully forward** .(NOTE: there is a small amount of deadband. This is part of the setup, and can be adjusted later.)
- ☐ With the throttle stick forward, adjust the o*ffset* parameter so that the flaps go to the neutral position, i.e. in line with the wing profile.
- ☐ Readjust *wt* and *offset* repeatedly, until the movement is correct **and** the flaps go to neutral correctly. You may have to go through two or three iterations to reach the final setup.
- ☐ Exit the mixer editor.
- ☐ Select Normal flight mode, and check that flaps go to the neutral position. If not, then chances are that the sticks are not calibrated (you didn't perform a calibration as instructed earlier? Naughty you! Calibrate your sticks now, and the re-start the setup procedure).

5.4 Calibrate ailerons (CHs 1, 2)

Calibrating the aileron servos is easy! Just one thing to note: **in CAL mode, both ailerons move in the same direction** in response to the stick - this allows you to match up the ailerons simply by sighting down the fuselage.

- ☐ Enable CAL flight mode. The tx should chirp every five seconds.
- ☐ Go to the SERVOS menu
- ☐ Move the aileron stick to the **right; both ailerons should move up**. If necessary, reverse one or both servos. Do this by skipping to the *Direction* column and toggling with the Enter key. Be careful to press the Enter key once only.
- ☐ For each servo, adjust *Subtrim* so that the ailerons line up with the trailing edge of the wing.
- ☐ Set the end points of the servos. These will correspond to the 'never exceed' positions of the ailerons. Here's how to do it:
    - ☐ Move the aileron stick fully to the **right.** For each servo, increase *Max* until the linkage just start to bind in the **up** position, and then back off slightly.
    - ☐ Move the aileron stick fully to the **left**. For each servo, decrease *Min* until the linkage just start to bind in the **down** position, and then back off slightly.

☐ Re-adjust *Min* and *Max*, so that down and up travel are the same for each servo.

☐ Finally, equalise the travel on both ailerons, while still maintaining the equal up/down travel. Again, this may require backing off some adjustments.

☐ Check, and check again: **equal up/down on each aileron,** and **left and right ailerons match**!!

On many F3X models, the downward movement of the ailerons is limited because of the hinge geometry. In such cases, it will not be possible to match the up/down movement without restricting the upward movement as well. To get round this, **specify diff=+50 in the CAL mixer lines for each aileron**, then **adjust the down-movement to be 50% of up-movement**. The menu points for setting the calibration diff are as follows:

MIXER→CH01 (RtAil) →CAL→diff = 50
MIXER→CH02 (LtAil) →CAL→diff = 50

Note that the 50% diff you set here applies to calibration mode only. In other modes, you will adjust the diff using the rudder trim (see section 6).

☐ Exit CAL mode.

☐ Enter Normal mode and check the ailerons move correctly. Now that we're out of CAL mode, the down-going movement will be reduced by differential.
Don't worry that the travel and diff are not correct, those will be adjusted in §5.9 and §6.

5.5 (V-TAIL version only) Calibrate V-tail (CHs 5,6)

☐ Enable CAL mode. The tx should chirp every five seconds.

☐ Calibrate the V-tail servos, following the same steps as above for the aileron servos (see §5.4), but with the following difference: Pushing **up** (forward) on the elevator stick, should result in **both** surfaces moving **up** (this is the opposite of normal operation, it's just for calibration). If necessary, reverse the one or both servos by skipping to the *Direction* column and toggling with the Enter key (take care to press the Enter key once only).

☐ Exit CAL mode, and check that the surfaces respond correctly to rudder and elevator inputs.

5.6 (X-TAIL version only) Calibrate rudder (CH 5)

☐ Enable CAL flight mode. The tx should chirp every five seconds.

☐ Go to the SERVOS menu, select Rudder servo

☐ Check the direction of the servo. Move the rudder stick to the **right;** the rudder should move to the **right**. If not, then reverse the servo by toggling the *Direction* parameter.

☐ Adjust *Subtrim* so that rudder centres correctly.

☐ Set the servo end points as follows:

- ☐ Move the rudder stick fully to the right, and increase *Max* until the linkage just start to bind, and then back off slightly.
- ☐ Move the rudder stick fully to the left, and adjust *Min* so linkage just starts to bind. Back off slightly.

☐ Finally, equalise rudder movement left and right. You may need to back off either *Min* or *Max.*

☐ Exit CAL mode.

5.7 (X-TAIL version only) Calibrate elevator (CH 6)

☐ Enable CAL mode. The tx should chirp every five seconds.

☐ Calibrate the Elevator servo.
The same steps are the same as for rudder (§5.6), but with the following difference: Pushing **up** on the elevator stick, should cause the elevator to move **up** (this is the opposite of normal operation, this is only for calibration mode!). If the elevator moves *down,* reverse its servo by toggling the *Direction* parameter.

☐ Exit CAL mode

5.8 Backup your EEPROM

Well done, all the calibration is complete. This will be your restore point in case things go wrong.

☐ Backup your EEPROM to the SD card. From the Main Info screen, long-press Menu, then press Page till the Version menu appears, then press ENTER Long. There may be a short delay, so be patient.

5.9 Finalise controls and mixers

This is the fun bit - where your model comes to life!
You may wish to print a copy of this section for field use.

Control / mix	Adjustment point	Adjustment procedure
☐ **Ail travel/expo**	INPUTS→Ail	Adjust *wt* and *expo* for each flight mode. NOTE 1: The last line is a 'catchall', i.e. *all* flight modes are checked. It's a defensive measure in case any flight-modes are left out in the preceding lines. NOTE 2: The Diff parameter in the Inputs menu should be left at zero (it controls stick diff, not servo diff!)
☐ **Rud travel/expo**	INPUTS→Rud	*As above*
☐ **Ele travel/expo**	INPUTS→Ele	*As above.* Diff can be used to alter up/down ratio.
☐ **Aileron→flap mix**	GLOBALVARS→GV5	Aileron to flap (flapperon) mixing is set up per flight mode. 1. Open GlobalVars menu, highlight GV5("Ail2FL"). 2. Adjust mix per flight mode as follows: -Enable Normal mode, adjust GV5/FM0 -Enable Landing mode, adjust GV5/FM2 -Enable Climb mode, adjust GV5/FM3 -Enable Reflex mode, adjust GV5/FM4 Note: down-going movement will be affected by ail diff setting
☐ **Camber preset**	CH11 (FlapCm)→Camber CH10 (AilCm)→Camber	Camber is active in Climb mode. The amount is adjustable in flight via S2 (X9D) or F2 (X9E). To set the max possible camber: 1. Rotate S2 (X9D) or F2 (X9E) fully clockwise. 2. Enable Climb mode 3. Open the MIXER menu, go to CH11 (FlapCm)→Camber 4. Adjust *wt* for required max camber. To set up for ailerons, repeat steps 2-4, but using CH10 (AilCm)→Camber Finally, adjust camber for actual flight using S2/F2.

Control / mix	Adjustment point	Adjustment procedure
□ **Snapflap**	CH11 (FlapCm)→Snap CH10 (AilCm)→Snap	Snapflap (elevator to flap mixing) is active in Normal and Reflex modes. The amount is stored separately for ailerons and flaps. Overall amount can be adjusted in flight using the throttle trim. To set up: 1. Enable Normal mode 2. Move throttle trim fully back 3. Open MIXER menu, go to CH11 (FlapCm)→Snap 4. Hold full up elev 5. Adjust mixer *wt* to provide max possible snapflap. Now do the same for the ailerons: repeat steps 3-5 but using CH10 (AilCm)→Snap Finally, move throttle trim forward for flight setting. The trim setting is saved individually for Normal and Reflex modes.
□ **Reflex**	CH11 (FlapCm)→Reflex CH10 (AilCm)→Reflex	Reflex (negative camber) can be set up in Reflex mode. The amount is set individually for ailerons and flaps. To set reflex for flaps: 1. Select Reflex mode. 2. Adjust *wt* in CH11 (FlapCm)→Reflex for required reflex (+ve value) To set reflex for ailerons, repeat steps above, but using CH10 (AilCm)→Reflex NOTE: reflex falls off to zero as elevator is applied. This is by design: it allows reflex and snapflap to be adjusted independently.
□ **Spoiler→Aileron**	CH10 (AilCm) →Spoilr	Amount of up-aileron movement due to spoiler. To adjust, 1. Enable Landing mode 2. Deploy full spoiler. 3. Adjust *wt* for required up-aileron movement (<100)
□ **Spoiler→Ele compensation**	***Vtail:*** CH13(VeeCm)→SpComp ***Xtail:*** CH5(Elev)→SpComp	Alters elev angle as spoiler is applied in Landing mode. Amount of compensation can be varied in flight using the throttle trim. To set the maximum amount of compensation available: 1. Enable Landing mode. 2. Move throttle trim fully forward (for max compensation). 3. Deploy full spoiler. 4. Set *max possible* compensation, by adjusting *wt* in the relevant V- and X-tail mixer (see col left) 5. Move trim back to reduce compensation as required. NOTE: intermediate response can be adjusted in curve "SpComp"
□ **Combi rudder**	GLOBALVARS→GV4	Combi rudder is set per flight mode. 1. Open GlobalVars menu, highlight GV4("Combi"). 2. Enter +ve values only: -Enable Normal mode, adjust GV4/FM0 -Enable Landing mode, adjust GV4/FM2 -Enable Climb mode, adjust GV4/FM3 -Enable Reflex mode, adjust GV4/FM4 Check that the rudder moves in the correct sense
□ **Reverse diff**	GLOBALVARS→GV6	Increases travel of down-going aileron when full spoiler is applied, in order to improve roll response. To set this up: 1. Open GlobalVars menu, highlight GV6/FM2 2. Enable Landing mode 3. Apply full spoiler and full aileron 4. Increase GV6 until the lower aileron is at the desired position. NOTE: this measure for improving roll response is in addition to aileron diff suppression, which is automatically applied.

□ Congratulations, you've just finished setting up your Taranis! This is a good time to back up your EEPROM again.

6 Summary of in-flight adjusters

Here's a summary of the controls for trimming out your ship in flight.

Adjuster	Flight modes	Adjustment	Notes
Rudder trim	[all]	Aileron Diff	Trim right = higher roll response/less diff Diff is stored per flight mode. Default range of adjustment is 20 - 60%, can be altered by editing Curve 4 'DifRng'.
Throttle trim	Landing	Spoiler→Ele compensation	Trim forward = more compensation Compensation curve may be adjusted via points 2-4 of Curve 2 'SpComp'
Throttle trim	Normal,Reflex	Snapflap volume	Trim back = increase snapflap. Trim value is stored individually for Normal and Reflex modes.
S1 (X9D), F1 (X9E)	Normal,Reflex	Snapflap expo	Clockwise = increase expo (more sensitive)
S2 (X9D), F2 (X9E)	Climb	Camber	Clockwise = increase camber

7 Basic customisations

This section describes various simple customisations you can make. **Apply these only after the basic setup is complete.** Implementing these customisations will not affect any other settings.

The customisations cover the following areas:

- Flight mode switch location and order
- 'Instant Spoiler' (i.e using the spoiler stick to activate Landing mode)
- Adjusting spoiler stick deadband

7.1 Customising flight mode switches

Flight modes may be selected in one of two ways according to preference.

- Using 2 switches (the default)
- Using 1 switch + Spoiler stick ('Instant Spoiler' mode)

7.1.1 Using two switches

In this configuration, the active flight mode depends on two switches**.** This is the default. You can alter the switches and switch positions.

- ***SwMain*** (3-pos) selects the main flight mode Normal, Landing, Climb.
- ***SwRFX*** (3-pos) selects Reflex over Normal mode.

The table below shows the adjustment points and switch settings Substitute ***SwMain*** and ***SwRFX*** with the desired switches **SA**, **SB**, **SC**, **SD**, **SE**, or **SG**

Menu point	Setting	Default
FlightModes→'Landing'	***SwMain*** (↑↓ or -)	SA↑
FlightModes→'Climb'	***SwMain*** (↑↓ or -)	SA↓
FlightModes →'Reflex '	***SwRFX*** (↑↓ or -)	SB↓

Normal mode is selected when ***SwMain*** is in the third (unassigned) position. The default is SA-middle.

7.1.2 Using one switch + spoiler stick ('Instant Spoiler')

'Instant Spoiler' is new in v 3.1. It enables you to select Landing mode simply by applying spoiler (no separate switch needed). A single 3-position switch is used to select the other three flight modes. In this configuration:

- Landing mode must be assigned to logical switch **L5**.
- A 3-position switch ***SwMain*** selects flight modes Normal, Climb and Reflex. ***SwMain*** may be one of **SA**, **SB**, **SC**, **SD**, **SE**, or **SG.** The default is **SA**.

The table below shows the adjustments. Substitute your chosen 3-position switch for ***SwMain***:

Menu point	Setting	Example
FlightModes→Landing	**L5**	L5
FlightModes→Climb	***SwMain*** (↑↓ or -)	SC↓
FlightModes →Reflex	***SwMain*** (↑↓ or -)	SC↑

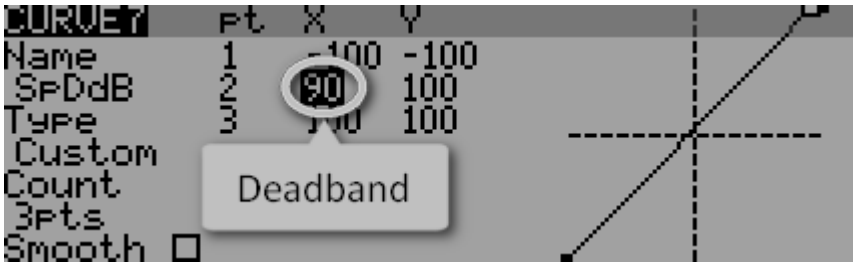
Normal mode is selected when ***SwMain*** is in the third (unassigned) position. In the example above, it would be SC-middle.

7.2 Adjusting spoiler stick deadband

The spoiler stick response incorporates some deadband at the idle end to help prevent accidental deployment. A small amount of deadband is also desirable to allow for pot drift and ratchet slip.

The default deadband should be fine for most pilots, however it can be adjusted as follows:

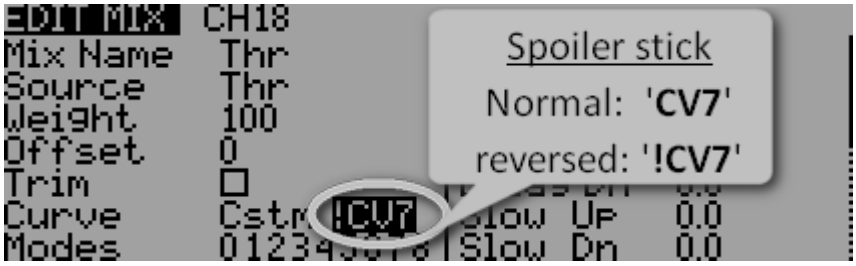
1 Go to Curves menu
2 Open Curve 7 ('SpDdB')
3 Change pt2 -> X. Decrease X to increase the deadband. Recommended max value is 95.



7.3 Reversing the spoiler stick

By default, zero spoiler corresponds to throttle stick fully-forward. To reverse the behaviour:

1. Open the mixer editor for CH18 (ThDdBd)→Thr
2. Skip to the Curve field
3. Change the curve from 'CV7' to '**!**CV7' (note leading exclamation mark).



8 User modifications

If you wish to make your own modifications, please study the Excel documentation carefully first and make sure you understand the implications.

The recommended workflow is:

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

9 Pre-flight checks

Before flying with this setup for the first time, make sure you

- set the battery alarm threshold to suit your battery chemistry, for both the tx and rx.
- set the failsafe

10 Disclaimer

Pretty obvious really, but worth repeating: although this setup is well tested, it's up to the pilot to make sure that the controls respond correctly under all conditions. The author can't be held responsible for any bugs in the setup or documentation. Remember to test your setup thoroughly before flying!

11 Contact

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.

Happy flying!

Mike Shellim