F3F Setup

for FrSky Taranis

Version 3.0

Setup Guide

Mike Shellim
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1 Introduction

The FrSky Taranis is a wonderfully flexible radio. Yet, while in many ways it is the perfect platform for F3X sailplanes, the programming can appear more than a little daunting to the uninitiated. With F3F Setup for Taranis, pilots can enjoy a fully featured, competition-proven setup - without the hassle of programming from scratch.

The setup offers a simple interface for F3F racing, whilst providing in-flight adjusting for key mixers for quick trimming.

Basic specifications

- Supports 6-servo gliders
- V-tail and X-tail versions
- Flight modes: Normal, Climb, and Landing
- Reflex option for Normal flight mode
- For OpenTx v.2

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

Advanced mixing

- Aileron differential suppression
- Spoiler compensation with multi-point curve
- Coupled ailerons and rudder (combi)
- Mixers linked to flight modes
- *[improved in v3]* Snapflap with adjustable volume, and expo
- *[new in v3]* Reverse Diff for better roll control under braking

Other

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

2 Contents of ZIP package

The contents of ZIP package are as follows:

Filename	Description
F3F_v30_userguide.pdf	this document
F3F_v30_reference.xls	settings reference
F3F_v30x_setup.eepe	EEPROM image
anormal.wav	Sound files for flight modes
areflex.wav	
acal.wav	
alanding.wav	
aclimb.wav	

3 What you will need

- A FrSky Taranis transmitter flashed with OpenTx 2.x (see web page for list of recommended versions)
- 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

There are four flight modes selected via switches SA and SB.
SA is the main flight mode switch, for selecting Climb, Normal/Reflex, or Landing modes.
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	Snapflap expo (NORMAL & REFLEX modes)
Rotary knob S2	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 'CAL' is provided to aid setting up servo limits and centres. When CAL is enabled, 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.
- ☐ Using OpenTx Companion,
  - ☐ 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 the sound files are in the correct location (see above).

5.2 First task: calibrating the flaps

Start by calibrating the flaps. By 'calibrating', we mean setting direction, centre and end points of each servo. The aim is to (a) limit servo travel to prevent damage to 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 accurate, 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 of the flap servos:

- ☐ 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 necessary, reverse the servo by toggling the *Direction* parameter. Be careful to press Enter once only.
  NOTE: Ignore any "INVERT THROTTLE" warning.

5.2.2 Left flap calibration

Now set the end points of the **left flap**. These should correspond to the 'never exceed' positions, i.e. the furthest the left flap can travel in each direction before damaging the linkage. Highlight the **LtFlap** line, then:

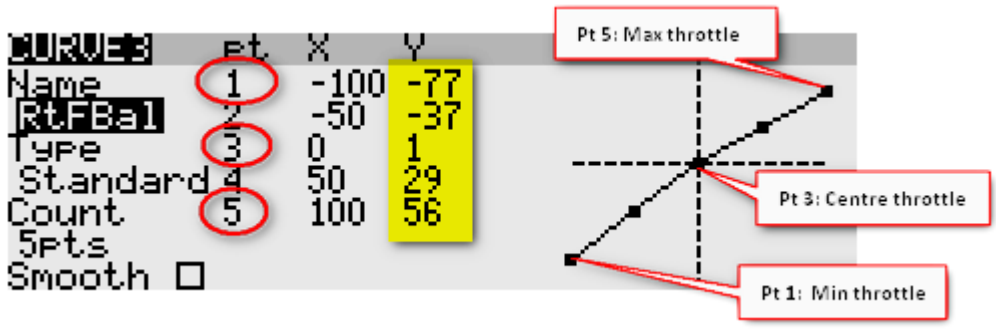
- ☐ Move the throttle stick fully **forward**. The left flap will move **up**.
- ☐ Adjust *Max* until the linkage just starts to bind, then back off a little.
- ☐ Move the throttle stick fully **back.** The left flap will move **down**.
- ☐ Adjust *Min* until the linkage just starts to bind, then back 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 step.
- ☐ Now set the centre for the **left flap only**. This adjustment is done without visualising - simply set *Subtrim* mid-way 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**
- ☐ The left flap should be moving reasonably linearly in response to the throttle stick. Check now.

5.2.3 Right flap calibration

We'll use a 5-point curve to adjust the **right flap**, using the left flap as our reference. Leave *Min*, *Max* and *Subtrim* at the defaults values (-100, 0, +100).

- ☐ Check that you're still in CAL mode, re-enter CAL mode if not.
- ☐ Highlight the **RtFlap** line, skip to Curve field ("CV3)
- ☐ Press ***long Enter*** on 'CV3'. 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, time to set up the spoiler movement and 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
- ☐ Scroll down to CH11 (FlapCm).
- ☐ Highlight the 'Spoiler' input and open the mixer editor.
- ☐ In the mixer editor, the *wt* parameter sets the total travel of the spoiler. 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.)
- ☐ While still in the mixer editor, push the throttle stick fully 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, 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 will 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 by toggling the *Direction* parameter.
- ☐ Adjust *Subtrim* for each servo, 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 some 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 (LtAil) →CAL→diff = 50
> MIXER→CH02 (RtAil) →CAL→diff = 50
>
> Note the diff you set here is only for calibration – diff for flight will be set up separately.

☐ 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** on the elevator stick, should result in **both** surfaces moving **up** (again, this is the opposite of normal operation, it's just for calibration!). If necessary, reverse the one or both servos by toggling the *Direction* parameter.

☐ 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. These will correspond to the 'never exceed' positions of the rudder, i.e. the furthest the rudder can travel before damaging the linkage. These are the steps:

- ☐ 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 Splash screen, long-press Enter, then press Page till the Version menu)

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 diff setting
☐ **Camber preset**	CH11 (FlapCm)→Camber CH10 (AilCm)→Camber	Camber is active in Climb mode. The amount is adjustable in flight via S2. To set the max possible camber: 1. Rotate S2 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.

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:*** CH31(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 In flight adjustments

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	Normal,Reflex	Snapflap expo	Clockwise = increase expo (more sensitive)
S2	Climb	Camber (S2)	Clockwise = increase camber

7 Reversing the spoiler

By default, full spoiler corresponds to throttle stick fully back. If you prefer to fly with spoiler reversed, open the mixer editor for CH16 (Spoilr)→Thr, and change *wt* from +100 to -100.

8 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

9 Modifying the setup

If you wish to modify the setup, then please study the Excel documentation first and plan your changes carefully. The recommended approach is

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

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. I 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