F3F Setup for FrSky Taranis

Version 2.4

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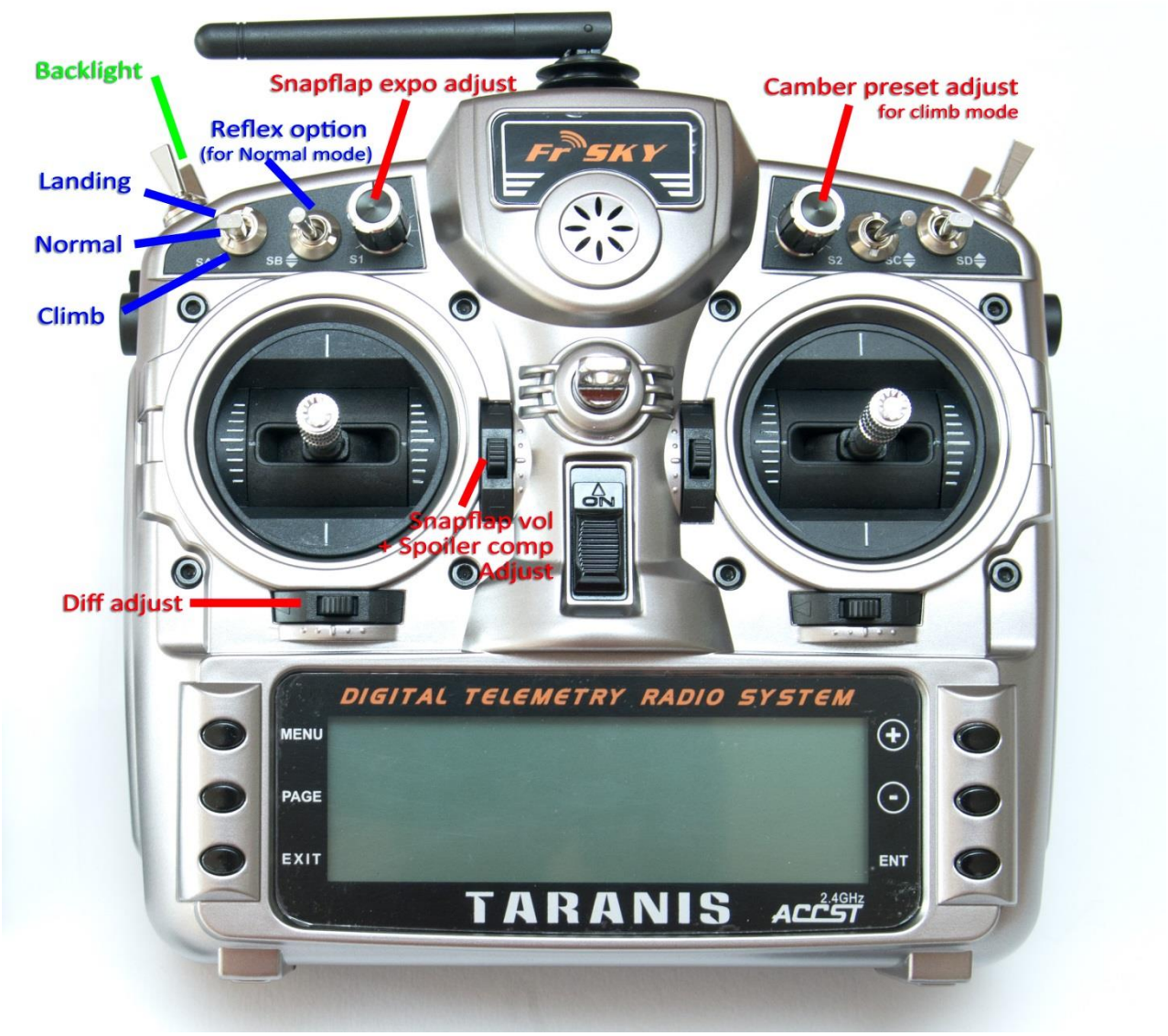
10 June 2014



Introduction

The Taranis is an amazingly flexible radio, but complex applications like F3X can be tricky to program. The aim of this project is to enable Taranis owners to enjoy a competition-proven setup, without the hassle of programming from scratch.

F3F Setup for Taranis has been refined over several years of competition in the UK league, and is designed for ease of flying as well as ease of adjustment of key trimming parameters.

Basic specifications

- Supports 6-servo gliders
- V-tail and X-tail versions
- Flight modes: Normal, Climb, and Landing
- Reflex option for Normal flight mode
- Compatible with OpenTx v.1 and v.2

Advanced mixing

- Aileron differential suppression
- Spoiler compensation with multi-point curve
- Coupled ailerons and rudder (combi)
- Mixers linked to flight modes
- Snapflap with adjustable volume, and expo

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

Other

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

Compatibility

F3F Setup version 2.4 is compatible with OpenTx versions 1 and 2. Recommended OpenTx version is r2940 (the final - and very stable - release of the "classic" series).

You can reflash your transmitter to OpenTx version 2 later, if you wish. OpenTx will convert your EEPROM to the newer format, and your existing F3F setups should continue to work fine. However, the conversion is one way only, so make sure you backup both your firmware and EEPROM first.

Skills required

A good working knowledge of OpenTx is needed, including menu navigation and data entry. You'll also need to know how to transfer model setups to your transmitter using Companion9X. Please read through this manual carefully before commencing.

Files provided

Filename	Description
F3F_v240_instructions.pdf	this document
F3F_v240_reference.xls	settings reference
F3F_v240_setup.eepe	EEPROM image for Companion 9X
anormal.wav	Sound files for flight modes
areflex.wav	
alanding.wav	
aclimb.wav	

Flight modes and mixers

There are four flight modes, selected via switches SA, SB:

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

Switch SA is the main flight mode switch for selecting Climb, Normal/Reflex, or Landing modes.
Switch SB selects Normal or Reflex for the middle position of SA.

Control assignments

Primary controls are mode 1 or mode 2 depending on tx setting. Secondary controls are assigned as follows:

Control	Function
Rudder trim	Diff adjust
Throttle trim	Snapflap volume adjust (NORMAL & REFLEX modes) Spoiler compensation adjust (LANDING mode)
Rotary knob S1	Snapflap expo adjust
Rotary knob S2	Preset camber adjust
Switch SF	Backlight

Servo channel assignments

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]	

'Calibration' mode

A special CAL (*calibration)* flight mode is included to aid setting up servo limits and centres. When CAL mode is enabled, all mixers and trims are disabled, allowing servo centres and limits to be visualised.
To enable CAL:

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

When CAL is enabled, the tx emits a chirp every 5 seconds.
To exit CAL mode, press SH again.

Using Companion 9X

If you wish to try out the setup in Companion9X, it is suggested:

- For ease of navigation, check "Show channel names in mixers" in the main editing screen of C9X.
- The default servo end points are conservatively set to aid calibration. If familiarising in C9X, go to the LIMITS menu and set *MAX* = 100 and *MIN* = -100 on all servo channels.

Setting up the radio

Adjustments should be made in sequence, and tick boxes are provided for recording your progress.

Before you start

- ☐ Copy the flight mode sound files to the /SOUNDS/[lang] folder of the Taranis's microSD card.
- ☐ Choose a setup in the supplied .EEPE file and copy it to your EEPROM.
- ☐ It's important to perform a hardware stick calibration (*MENU long press →CALIBRATION*).

STEP 1 - Calibrate Flap servos and set up the Spoiler

Let's start with the most difficult task - calibrating the flap servos. By 'calibrating', we mean setting direction, centre and end points of each servo. We'll use the special CAL flight mode for this.

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

Step 1.1 - Calibrate flap servos (CHs 3,4)

- ☐ 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 flap servo directions: Move the throttle stick **forwards**. Both flaps should move **up**. Note this is the reverse of the way spoiler will eventually work. If either flap moves *down*, reverse the direction in *SERVOS →DIRECTION*.
- ☐ Set the flap servo end points. These are 'never exceed' positions, i.e. *the furthest the servos can travel before damaging the linkages*. Don't be too conservative with these adjustments, otherwise you'll restrict yourself later. These are the steps for each servo:
    - ☐ Move the throttle stick fully **forward**. The flaps will move **up**. Adjust *MAX* until the linkage starts to bind, then back off a little.
    - ☐ Move the throttle stick fully **back.** The flaps will move **down**. Adjust *MIN* until the linkage starts to bind, then back off a little.
- ☐ Readjust *MAX* and *MIN* so the **end points of the flaps match exactly**. In practice, you'll probably want to do this step concurrently with the previous step.

- [ ] Move the throttle stick forwards and back. Note how the movement of the flap is non-linear. We're going to fix that in the next step.
- [ ] Now turn your attention to adjusting the servo centres. The goal of this step is to make the flaps move more linearly with respect to the throttle stick. The adjustments in this step are done without visualising. For each flap servo, simply set *LIMIT→SUBTRIM* to the average of *MIN* and *MAX*. So, for example, if a servo has *MIN* = -80 and *MAX* = +20, then:
  set *LIMIT→SUBTRIM* to (-80 + 20)/2 = **-30** for that servo.
- [ ] Move the throttle stick forward and back, and check that the flaps are now moving reasonably linearly with respect to the throttle stick.
- [ ] OK, now you're going to finalise the servo centres. Move the throttle stick to the centre (16 clicks from top or bottom). If the flaps are not perfectly in line, adjust *SUBTRIM* for each servo. Make small adjustments, closing the gap each time, until the flaps are exactly in line with each other. Don't worry that the flaps don't line up with the trailing edge - we'll correct that later.
- [ ] At this point, the flaps should match up perfectly when the throttle stick is in 3 positions: fully forward, centre, and fully back. Check now.
- [ ] Move the throttle stick back and forth again slowly; this time check that the flaps match each other at the flap neutral position - if tracking isn't good at that point, then you may get better tracking by adjusting the ¼ and/or ¾ points, by fine-tuning points 2 or 4 of the RtFlpBal curve.
- [ ] Finally, double-check the tracking by moving the throttle stick back and forth once more.
- [ ] Exit CAL mode

Pause to pat yourself on the back. Not so bad, was it?!!

Step 1.2 - Set spoiler movement and flap centres

Now that you've got your flap surfaces tracking nicely, setting up Spoiler is going to be a piece of cake!

- [ ] Select LANDING mode
- [ ] Enter the *MIXER* menu, and scroll down to CH11 (FlapCm). Highlight the 'Spoilr' input of and open the mixer editing screen.
- [ ] The *wt* parameter sets the total travel of the spoiler. Start with say between 60% and 80%. Don't worry about over-driving the servos - you've already calibrated the servos so they'll stop dead before doing any damage.
- [ ] Push the throttle stick fully forward. Adjust the mixer o*ffset* parameter so that the flaps go to the neutral position i.e. in line with the wing profile.
- [ ] Repeat adjusting *wt* and *offset* until you have the movement required **and** the flaps go to neutral correctly.
- [ ] Exit the mixer editing menu.
- [ ] Select NORMAL flight mode, and check that flaps are in the neutral position. If they are not in the neutral position, chances are that you skipped the hardware stick calibration. If so, do it now and start again.

STEP 2 – Calibrate aileron servos (CHs 1, 2)

Relax - calibrating the aileron servos is going to be easy!

Just one thing to note: in CAL mode **both ailerons will move in the same direction** - this may sound weird, but it will allow you to match up the ailerons by sighting down the fuselage.

- ☐ Enable CAL flight mode. The tx should chirp every five seconds.
- ☐ Go to the *SERVOS* menu
- ☐ Check the direction of the servos. As you move the aileron stick to the **right** both ailerons should move **up**. If not, then reverse the direction of the corresponding servo in *DIRECTION* field .
- ☐ Adjust *SUBTRIM* for each servo, so ailerons line up with the trailing edge of the wing.
- ☐ Set the end points of the aileron servos. These will correspond to the 'never exceed' positions of the control surfaces, i.e. the furthest the ailerons can travel before damaging the linkages. Don't be too conservative with these adjustments; otherwise you'll restrict yourself later. 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: remember, **equal up/down, and both sides match**!!

> **Exception**: 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% the up-movement**. The menu points for setting the calibration diff are as follows.
>
> MIXER→CH01 (LtAil) →CAL→diff
> MIXER→CH02 (RtAil) →CAL→diff.
>
> The diff you set here is ***only for calibration***. Final diff will be set up using a separate procedure.

- ☐ Exit CAL mode.
- ☐ Enter NORMAL mode and check the ailerons move correctly. Don't worry that the aileron travel and diff are wrong, you'll adjust that in Step 4.

STEP 3 – (V-TAIL version only) Calibrate V-tail servos (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 (step 2 above), but with the following difference: Pushing **up** on the elevator stick, should result in both surfaces moving **up** (yes, this is the opposite of normal operation, it's just for calibration!). If either tail surface moves *down*, reverse its direction by setting *DIRECTION to* 'INV'.
- ☐ Exit CAL mode

STEP 3A – (X-TAIL version only) Calibrate Rudder (CH 5)

- ☐ Enable CAL flight mode. The tx should chirp every five seconds.
- ☐ Go to the *SERVOS* menu
- ☐ Check the direction of the servo. As you move the rudder stick to the **right** the rudder should move to the **right**. If it moves to the *left*, reverse the direction of the servo by setting *DIRECTION* to 'INV'.
- ☐ 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.

STEP 3B – (X-TAIL version only) Calibrate Elevator (CH 6)

- ☐ Enable CAL mode. The tx should chirp every five seconds.
- ☐ Calibrate the Elevator servo, following the same steps as above for the rudder servo (step 3A), but with the following difference: Pushing **up** on the elevator stick, should result in the elevator servo moving **up** (yes, this is the opposite of normal operation, this is only for calibration mode!). If the elevator moves *down*, reverse its servo by setting *DIRECTION* to 'INV'.
- ☐ Exit CAL mode

STEP 4 – Adjust control travel and mixing

This is the last bit – and the fun bit! (You may wish to make a copy of this page for field use.)

Control / mix	Adjustment point	Adjustment procedure
Travel and Expo for primary controls		
☐ Aileron	STICK→Ail	Adjust travel and expo to suit. Add lines for flight modes as required.
☐ Elevator	STICK→Ele	*As above*
☐ Rudder	STICK→Rud	*As above*
Mixes to FLAPS		
☐ Aileron→flap	GLOBALVARS→GV5	Set per flight mode. Enter values > 0.
☐ Max snapflap	CH11 (FlapCm)→Snap	1. Enable NORMAL mode 2. Move throttle trim to minimum (down). 3. Hold full up elev 4. Adjust *wt* for maximum snapflap. 5. Enable REFLEX mode and repeat steps 1 – 4.
☐ Reflex	CH11 (FlapCm)→Reflex	1. Select REFLEX mode. 2. Adjust *wt* (+ve) for required reflex.
☐ Max camber	CH11 (FlapCm)→Camber	1. Enable CLIMB mode. 2. Rotate S2 fully CW. 3. Adjust *wt* (-ve) for maximum camber.
Mixes to AILERONS		
☐ Spoiler→Aileron	CH10 (AilCm) →Spoilr	1. Enable LANDING mode 2. Deploy full spoiler. 3. Adjust *wt* for required up-aileron movement
☐ Max snapflap	CH10 (AilCm)→Snap	*As corresponding flap mix above, but using CH10*
☐ Reflex	CH10 (AilCm)→Reflex	*As corresponding flap mix above, but using CH10*
☐ Max camber	CH10 (AilCm)→Camber	*As corresponding flap mix above, but using CH10*
Mixes to ELEVATOR		
☐ Spoiler→Ele compensation	***Vtail:*** CH13 (VeeCm)→Spcomp ***Xtail:*** CH05 (Elev)→Spcomp	1. Enable LANDING mode. 2. Throttle trim is compensation adjuster. Move it fully forward. 3. Deploy full spoiler. 4. Set *max possible* compensation, by adjusting *wt* in the relevant mix. 5. Move trim back to reduce compensation as required.
Mixes to RUDDER		
☐ Combi rudder	***Vtail:*** CH12 (VeeAlt)→Ail ***Xtail:*** CH06 (Rudd)→Ail	1. Enable either NORMAL or REFLEX mode. 2. Hold full aileron 3. Adjust *wt* to set required rudder movement (wt>0)
In-flight adjustments		
☐ Snapflap volume	Throttle trim	1. Select NORMAL mode 2. Adjust throttle trim for desired snapflap 3. Select REFLEX mode, repeat steps above
☐ Snapflap expo	Adjust via S1	1. Select either NORMAL or REFLEX mode 2. Adjust S1 in flight for required snapflap expo
☐ Camber (S2)	Adjust via S2	Select CLIMB mode, and adjust S2 for desired camber
☐ Aileron Diff	Rudder trim	Adjust in flight for each flight mode Default range is 20 - 60% (CH15)
☐ Spoiler→Ele compensation	Throttle trim CURVES→SpComp	1. Select Landing mode 2. Deploy *full* spoiler 3. Adjust throttle trim for required compensation. Intermediate response may be adjusted via points 2-4 of curve 'SpComp'

Reversing the spoiler

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

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

Disclaimer

Obvious, 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!

Modifying the setup

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

1. First, set up your model according to these instructions
2. Make a backup of your EEPROM
3. Apply your modifications

If you make a mistake with your setup, restore the EEPROM and continue.

Change log

V2.4

- Changed format of version number and file naming. Otherwise identical to previous version.

V2.04

- Minor changes for compatibility with OpenTx v. 2.x

V2.03

- Added in-flight adjustment of spoiler compensation via throttle trim lever
- Improved documentation

v2.02

- Enhanced aileron trim scheme, avoids trim change if diff altered.
- Improved documentation

v2.01

- Changed some mixer default values in .eepe file
- Aileron trim behaviour changed to 'global' across flight models
- Included experimental X-tail version
- Default servo end points reduced to +/-30% to lessen chance of over-travel during calibration

Contact

If you like the setup, or or have any queries or suggestions, or if you find interesting ways to extend it, please let me know! You can contact me at http://rc-soar.com/email.htm.
Happy flying! – Mike Shellim