# F3F Setup for Taranis

## Version 2.02

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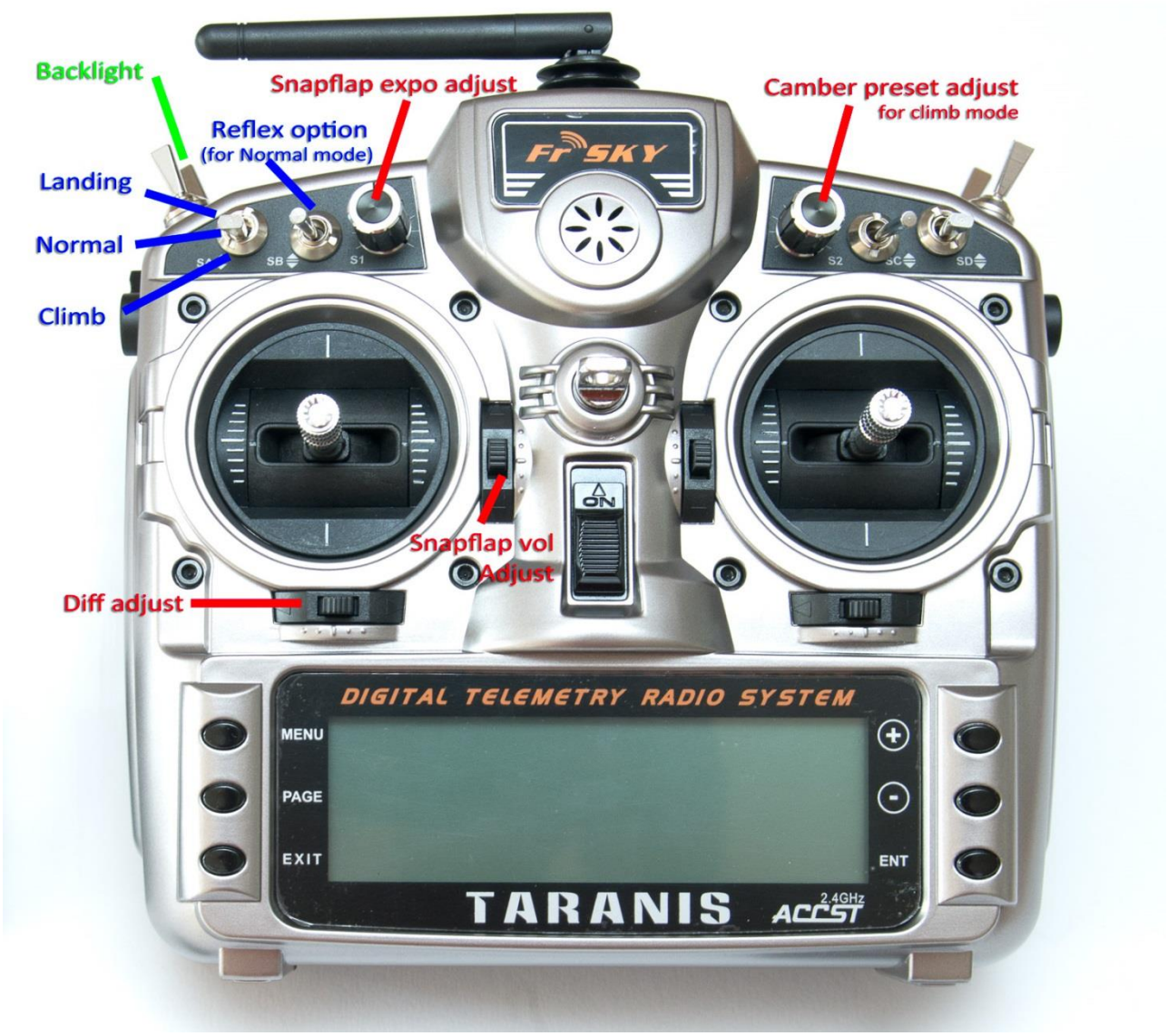

## Introduction

The Taranis is an amazingly flexible radio, but it can also be tricky to program. The purpose of this project is to enable Taranis owners to enjoy a competition-proven setup for their full house gliders, without the hassle of programming from scratch.

The setup 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.

***Main specifications***
- Supports 6-servo gliders
- V-tail and X-tail versions included
- Flight modes: Normal, Climb, and Landing
- Reflex option for Normal flight mode

***In-flight adjustments (for trimming)***
- adjustable snapflap volume
- adjustable snapflap expo **(new)**
- adjustable aileron diff
- adjustable camber preset

***Advanced mixing***
- Aileron differential suppression
- Spoiler compensation with multi-point curve
- Coupled ailerons and rudder (combi)
- Mixers linked to flight modes

***Other***
- Full travel can be employed on flap servos (even if flap travel is asymmetric)
- Balancing curve for flaps ensures accurate tracking
- 'Calibration' mode for adjusting servo centres and limits **(new)**
- Step-by-step instructions **(new)**

## Pre-requisites

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 also read through this manual once through carefully before commencing.

## Files provided

| Filename | Description |
|---|---|
| **F3F_v202_instructions.pdf** | this document |
| **F3F_v202_reference.xls** | settings reference |
| **F3F_v202_setup.eepe** | EEPROM image for Companion 9X |
| **anormal.wav** | Sound files for flight modes |
| **areflex.wav** | |
| **alanding.wav** | |
| **aclimb.wav** | |

## Flight modes

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

| SA | SB | Flight Mode no./name | Mixers active |
|---|---|---|---|
| **down** | | #3 CLIMB | Camber (via S2) |
| **middle** | Up | #0 NORMAL | Snapflap |
| | Down | #4 REFLEX | Snapflap, Reflex |
| **Up** | | #2 LANDING | Spoiler |

The flight mode scheme is designed for ease of use. The main flight mode switch (SA) transitions between Climb, Normal, and Landing modes. For windy conditions reflex can be preselected before flight (SB).

## Controls

The setup supports both Mode 1 and Mode 2 operation. Controls are assigned as follows:

| Control | Function |
|---|---|
| **Rudder trim** | Diff adjust |
| **Throttle trim** | Snapflap volume |
| **Rotary knob S1** | Snapflap expo |
| **Rotary knob S2** | Preset camber adjust (climb mode) |
| **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 solely for setting up servo limits and centres. CAL takes priority over all other flight modes. When CAL mode is enabled, all mixing and trims are ignored, allowing the 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 want to familiarise with the setup using Companion9X, here are some recommendations:

- For ease of navigation, check "Show channel names in mixers" in the main editing screen of C9X.
- The default servo end points have been set conservatively. 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.
- ☐ 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)
- ☐ If you previously altered the flap balancing curve (curve 3), first reset it to the default 45 degree line
- ☐ Enable CAL flight mode
- ☐ 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 servo directions: Gradually 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 end points for the flap servos. 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 -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). The flaps will probably not be in line (unless you're lucky!). No worries, just make a mental note of the *average* position. Now adjust *SUBTRIM* for each servo, so the flaps move to the average position in line with each other. Don't worry that the flaps don't line up with the trailing edge - we'll correct that later when we set the spoiler offset.
- [ ] 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

OK, that's the servo calibration done. Not so bad, was it?!!

### Step 1.2 - Set spoiler movement

Now that you've got nicely tracking flap surfaces, 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 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.

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

Relax - calibrating the aileron servos is easy! Just one thing to note: in CAL mode **both ailerons will move in the same direction** - this may sound weird, but it makes it easier to match the travels on each side.

- ☐ Enable CAL flight mode
- ☐ 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.

> NOTE FOR ADVANCED USERS: If down-movement of the ailerons are limited (e.g. by top hinge), then you can specify some differential to aid calibration. For example, if you set calibration diff to +50, then you can calibrate so that down movement = ½ up movement. This will not affect your diff choices when flying, it's simply a convenience for calibration. The menu points for setting calibration diff are as follows.
>
> MIXER→CH01 (LtAil) →CAL→diff.
> MIXER→CH02 (RtAil) →CAL→diff.

- ☐ 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**!!
- ☐ 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
- ☐ Calibrate the V-tail servos, following the same steps as above for the aileron servos, 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
- ☐ 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
- ☐ Calibrate the Elevator servo, following the same steps as above for the rudder servo, 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 where your plane comes to life!
Perform the remaining steps in the order shown. Refer to the Excel spreadsheet if necessary.

| Control / mix | Adjustment point | Adjustment procedure |
|---|---|---|
| **Primary mixes** | | |
| □ Ail→Aileron | STICK→Ail | Adjust travel, add lines per flight mode as required |
| □ Ele→Elevator | STICK→Ele | *As above* |
| □ Rud→Rudder | STICK→Rud | *As above* |
| **Mixes to AILERONS** | | |
| □ Spoiler→Aileron | CH10 (AilCm) →Spoilr | Enable LANDING mode and deploy full spoiler. Adjust *wt* to set up-aileron movement |
| □ Max snapflap volume | CH10 (AilCm)→Snap | Enable NORMAL mode and move throttle trim to minimum (down). While holding full up elevator, adjust *wt* for maximum snapflap. Enable REFLEX mode and repeat. |
| □ Reflex | CH10 (AilCm)→Reflex | Select REFLEX mode. Adjust *wt* (+ve) for required reflex. |
| □ Max camber | CH10 (AilCm)→Camber | Enable CLIMB mode. Rotate S2 fully CW. Adjust *wt* (-ve) for maximum camber. |
| **Mixes to FLAPS** | | |
| □ Aileron→flap | GVARS→GV5 | Adjust per flight mode |
| □ Max snapflap vol | CH11 (FlapCm)→Snap | *As corresponding aileron mix* |
| □ Reflex | CH11 (FlapCm)→Reflex | *As corresponding aileron mix* |
| □ Max camber | CH11 (FlapCm)→Camber | *As corresponding aileron mix* |
| **Mixes to ELEVATOR (note different adj. points for VTAIL and XTAIL)** | | |
| □ Spoiler→Ele compensation | ***Vtail:*** CH13 (VeeCm)→Spoilr<br>***Xtail:*** CH05 (Elev)→Spoilr<br>CURVES→SpComp | Enable LANDING mode. Adjust *wt* in Spoilr line to set overall elevator compensation. After flight tests, adjust SpComp curve to tweak response. |
| **Mixes to RUDDER (note different adj. points for VTAIL and XTAIL)** | | |
| □ Combi rudder | ***Vtail:*** CH12 (VeeAlt)→Ail<br>***Xtail:*** CH06 (Rudd)→Ail | Enable NORMAL or REFLEX mode. Adjust *wt* to set amount of combi. |
| **In-flight adjustments** | | |
| □ Snapflap volume | Throttle trim | Adjust separately for NORMAL and REFLEX modes. |
| □ Snapflap expo | Adjust via S1 | Select NORMAL or REFLEX mode, adjust in flight. |
| □ Camber (S2) | Adjust via S2 | Adjust in flight in CLIMB mode. |
| □ Aileron Diff | Rudder trim | Adjust in flight per flight mode. Default range is 20 - 60% (CH15). |

## Reversing spoiler operation

The default spoiler idle position is *throttle stick forward*. 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

Don't forget to

- Set the correct battery voltage alarm threshold to suit your battery chemistry (both for the receiver and the transmitter).
- Set failsafe on your receiver.

## 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, so please remember to test your setup thoroughly before flying!

## Change log

### 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

## Feedback

If you like the setup, or or have any queries or suggestions, or if you find interesting ways to extend it, I'd love to hear from you. You can reach me at http://rc-soar.com/email.htm.

Happy flying! – Mike Shellim