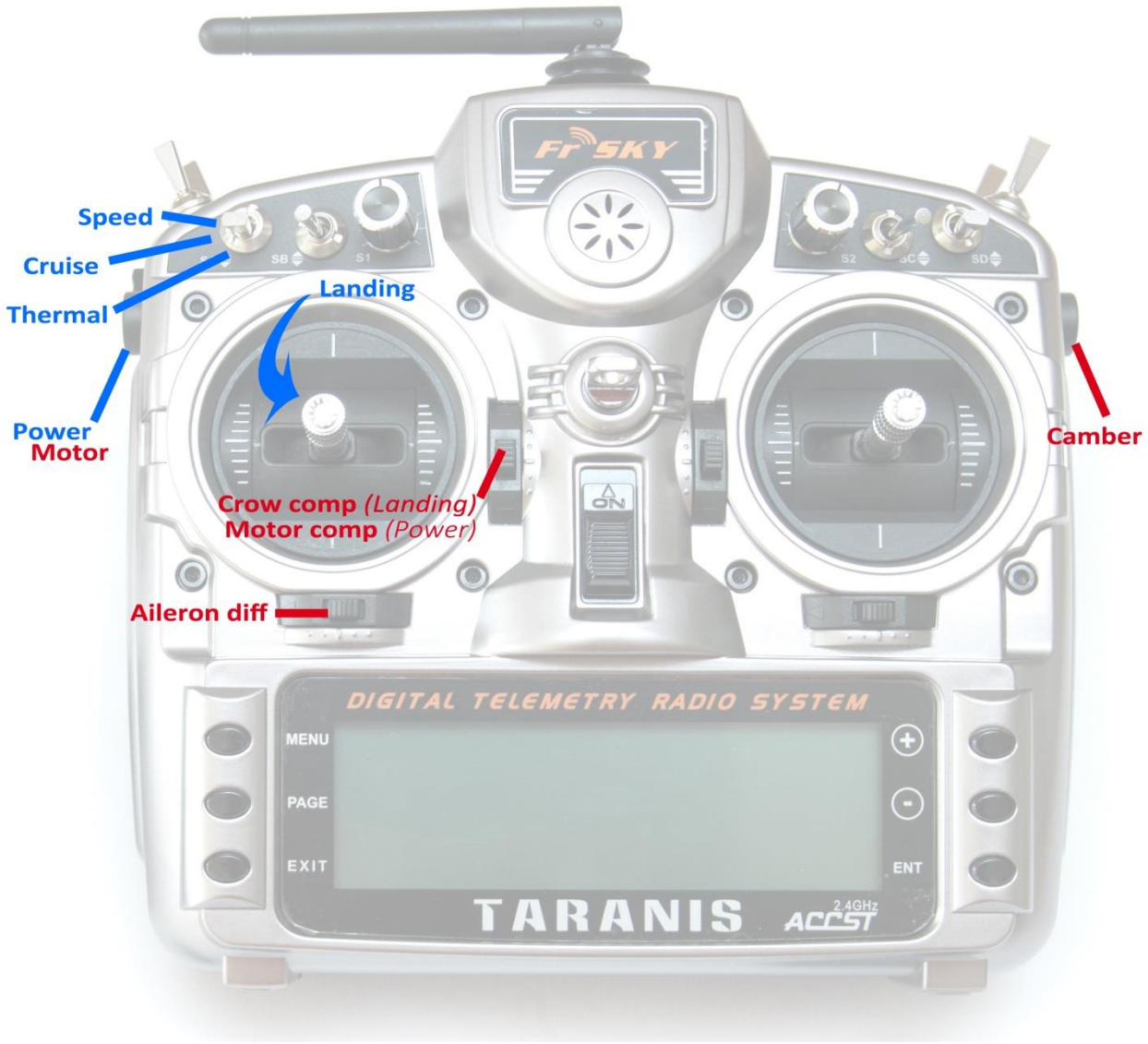
E-Soar Plus for Taranis & Horus

Version 3.0

Setup Guide

Mike Shellim
28 Jan 2018



Copyright © Michael Shellim

Table of Contents

1 Introduction ... 3
1.1 Package contents ... 3
1.2 Requirements ... 3
1.3 Flight modes ... 3
1.4 Stick mode and assignments ... 3
1.5 Mixers ... 4
1.6 Channel assignments ... 4
2 Operational Overview ... 4
3 Motor operation ... 5
3.1 Arming the motor ... 5
3.2 Running the motor ... 5
3.3 Disarming the motor ... 5
4 Flight timer ... 5
5 CAL mode ... 5
6 Setting up your transmitter ... 6
6.1 Preparing the transmitter ... 6
6.1.1 Transfer template to transmitter ... 6
6.1.2 Hardware calibration ... 6
6.1.3 Corrections for different transmitters ... 7
6.1.4 Familiarisation ... 7
6.2 Calibrating the servos ... 7
6.2.1 Set servo rotation ... 7
6.2.2 Adjust end-points and centres ... 8
7 Configuring inputs and mixers ... 10
8 Motor safety check ... 12
9 Summary of in-flight adjusters ... 13
10 Pre-flight ... 13
11 Customisations ... 13
11.1 Changing the assignments of Crow, Motor and Camber ... 13
11.2 Changing the flight mode switch ... 13
11.3 Reversing the crow stick ... 14
11.4 Reversing motor lever ... 14
11.5 Reversing camber lever ... 14
11.6 Dual rates ... 14
11.7 Adjusting crow stick deadband ... 15
11.8 Selecting an alternative arming method ... 15
11.8.1 Method 1(default): stick in corner, pull SH ... 15
11.8.2 Method 2: Pull SH ... 15
11.8.3 Method 3: Two-position switch ... 15
12 Making your own mods ... 16
13 Disclaimer ... 16
14 Contact ... 16

1 Introduction

E-Soar Plus is a full-feature template for full-house electric-powered gliders. It contains all the mixing needed for F5J competition, yet is easy to configure and operate. Special attention has been paid to motor safety. Key mixers may be adjusted in flight. An integrated flight timer is included.

Before starting please:
- read through these instructions
- visit the support page

1.1 Package contents

Filename	Description
esoarplus_30_SetupGuide.pdf	Setup guide
esoarplus_30_SettingsRef.xls	Settings reference
esoarplus_30x.eepe	EEPROM images for V- and X/T- tail
esp***.wav	Sound files

1.2 Requirements

- FrSky Taranis or Horus transmitter
- OpenTx 2.2.1 or later (see change log for recommended versions)
- OpenTx Companion software + USB cable.

Some familiarity with the OpenTx's menus and data entry will be useful.

1.3 Flight modes

There are 5 flight modes: Power, Landing, Thermal, Cruise and Speed. In the event of a clash, Power has highest priority, then Landing, then Thermal/ Cruise/Speed.

Flight Mode	OpenTx ID	Activated by	Priority
Power	**FM2**	**LS↑ (if motor is armed)**	**High**
Landing	**FM3**	**Throttle stick ↓**	**Mid**
Speed	FM5	SA ↑	Low
Cruise	FM4	SA —	Low
Thermal	FM0	SA ↓	Low

A special CAL flight mode (FM1) is provided for calibrating the control surfaces.

1.4 Stick mode and control assignments

The stick mode (1 – 4) is as set in **RADIO SETUP → MODE**.
Default control assignments are as follows:

Control	Assigned to
Throttle stick	Crow
Throttle trim	Crow compensation adjust (Landing mode) Motor compensation adjust (Power mode)
Rudder trim	Aileron diff adjust
SA	Flight mode selector
LS	Motor
RS	Camber adjust (Thermal mode)
SH	Cancel CAL mode, Motor arming options 1, 2
SF	Motor arming option 3

1.5 Mixers

The table below shows which mixers are active in each flight mode. Mix adjusters are in brackets.

Flight mode	Ail→ Flap	Ail→ Rud	Motor Comp	Crow comp	Rev diff	Camber	Diff
Power	Y	Y	Y(**Thr trm**)				Y(**RudTrm**)
Landing	Y	Y		Y(**Thr trm**)	Y		Y(**RudTrm**)
Cruise	Y	Y					Y(**RudTrm**)
Thermal	Y	Y				Y (**RS**)	Y(**RudTrm**)
Speed	Y	Y				Y	Y(**RudTrm**)

1.6 Channel assignments

Channel #	Function	
1	Right aileron	
2	Left aileron	
3	Right flap	
4	Left flap	
5	Elevator	RtVee
6	Rudder	LtVee
7	Motor	
8	[free]	
9	[free]	

2 Operational Overview

Flight trims

- Aileron trim is shared across all flight modes
- Elevator trim is independent for each flight mode
- Rudder and throttle trims are repurposed for other functions (see below)

Camber mixes

- Camber is adjustable in Thermal mode using slider **RS**.
- Reflex (fixed) may be specified for Speed mode.

Crow compensation (crow to elevator)

- Crow compensation is a variable mix which compensates for pitch changes as crow is deployed.
- The amount of compensation can be adjusted during flight, via the **Throttle trim**.
- Non-linear compensation may be applied by editing a curve

Motor compensation (motor to elevator)

- Motor compensation is a variable mix which compensates for pitch changes as power is applied.
- The amount of compensation can be adjusted via the **Throttle trim**.

Differential

- Diff is applied to ailerons and flaps
- Diff is adjustable via the **Rudder trim**.
- Diff settings are stored per flight mode.

Roll rate enhancement

- Aileron diff reduces to zero as crow is deployed. This helps with roll response under crow.
- An adjustable 'Reverse diff' mix further improves roll response under braking.

Aileron to rudder ('combi')

- Aileron to rudder mix can be applied individually for each flight mode.

3 Motor operation

3.1 Arming the motor

The motor is disarmed at startup. To arm the motor:

1. Motor lever to idle (**LS↓)**
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)

A warning beep sounds every 12 seconds to indicate that the motor is live

3.2 Running the motor

To run the motor:

1. Arm the motor
2. Push forward on **LS↑**

Power mode is activated automatically. *Note*: **LS** incorporates some deadband, to prevent accidental operation of the motor.

3.3 Disarming the motor

To disarm the motor, pull **SH** for 1 second until the 'motor disabled' alert.

> **☠ To minimise the risk window, arm just before launch, and disarm immediately after landing.**
>
> **☠ 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.**

4 Flight timer

Timer1 is configured as an automatic flight timer. The timer is named 'Flight'.

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

5 CAL mode

CAL mode is a special flight mode for calibrating the servos. When CAL mode is active, all mixers and trims are disabled. To enable CAL mode:

1. Apply full left aileron and full up elevator, and hold
2. Pull **SH**
3. Release **SH**
4. Release stick(s)

There are three CAL sub-modes selected via switch **SA**:

- Mode 1 **(SA↑)**: calibrate with reduced movement for ailerons
- Mode 2 (**SA—)**: calibrate end points and centres
- Mode 3 **(SA↓)**: calibrate flap neutral

In sub-mode 2 , the response of the throttle stick is stepped at 25% increments.
When CAL mode is enabled, a beep sounds every 3 secs and a voice alert every 9 secs.
To exit CAL mode, pull **SH**.

6 Setting up your transmitter

Transmitter configuration is in three phases:

1. Preparation – copying files to the transmitter
2. Servo calibration – setting servo end points and centres
3. Mixer and travel adjustment

Follow the sequence exactly as shown, using tick boxes to record your progress.

☠ Make sure that the motor is disconnected before proceeding.

6.1 Preparing the transmitter

6.1.1 Transfer template to transmitter

In this step you'll transfer the template to your transmitter. The methods may differ slightly depending on the model of transmitter.

Establish communication with your PC

- ☐ ***Taranis:*** Switch on the transmitter whilst pressing horizontal trim levers towards the centre
  Horus: Switch on the transmitter
- ☐ Connect the tx to the computer via USB. The tx's SD card should appear as an external drive.

Copy sound files

- ☐ On your PC, extract all files from .ZIP package
- ☐ Copy the sound files to the /SOUNDS/{language} folder on the SD card. For example, English folder is "/SOUNDS/en". *Note:* there are new sound files in version 3.

Transfer model to transmitter

- ☐ Launch Companion
- ☐ Open the esoarplus_30x.eepe file. Versions for X/T and V tails are displayed in a window.
- ☐ From the File menu, choose **READ MODELS AND SETTINGS FROM RADIO**. The model list from the radio is displayed in a second window.
- ☐ Drag one of the ESOARP models into an empty slot in the model list.
- ☐ Close the esoarplus_30x.eepe window.
- ☐ In the model list, right-click on new model and choose "Use as Default"
- ☐ From the File menu, choose **WRITE MODELS AND SETTINGS TO RADIO**.
- ☐ Close OpenTx Companion

6.1.2 Hardware calibration

Important: The transmitter hardware must be properly calibrated. Failure to calibrate is one of the main causes of problems, from jumping neutrals to flight modes which cannot be activated.

- ☐ Enter **RADIO SETUP** and page to Hardware -> Calibration (Horus) or Calibration (Taranis)
- ☐ Calibrate all sticks, knobs and sliders.

6.1.3 Corrections for different transmitters

The template targets the X9D. If using a different transmitter, then CH18 and CH20 must be checked for the correct source controls:

Channel	Mixer source
CH18:RawMot	LS
CH20:Camber	RS

To check the mixer sources:

- ☐ Open the **MIXERS** menu
- ☐ Scroll to required channel. Note the source. If incorrect, then:
  - ☐ Press {LONG ENTER} to open the mixer editor
  - ☐ Amend the source. *Tip:* You can use the dropdown menu, or simply move the control.
  - ☐ Press OK.

6.1.4 Familiarisation

Using the transmitter on its own, familiarise thoroughly with the following:

- ☐ Arming and disarming the motor **with motor disconnected** (see Section 3)
- ☐ Selecting Thermal, Cruise, Power, Speed and Landing modes (see Section 1.3)
- ☐ Activating CAL mode and sub-modes (see Section 5)
- ☐ Start/stop/reset integrated flight timer (see Section 4)

Verify that the sounds are working correctly. If not, check that the sound files are in the correct location.

6.2 Calibrating the servos

In this section you will calibrate the servos. The goals are:

- Maximise travel
- Achieve left/right symmetry
- Linearise responses

All the adjustments in this section are made in CAL mode.

Correct calibration is essential for diff to work correctly, and for precise tracking of flaps with ailerons.

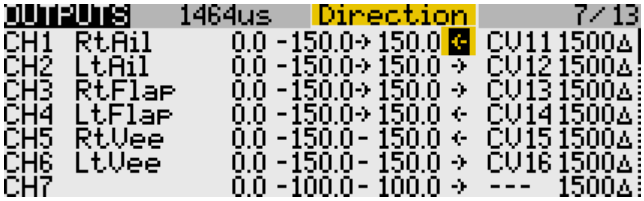
6.2.1 Set servo rotation

- ☐ Switch on the transmitter (do not power up the receiver yet)
- ☐ Crow stick to centre
- ☐ Enter CAL mode, and set switch **SA** to middle.
- ☐ Power up the receiver
- ☐ Open the **OUTPUTS** menu
- ☐ Set the rotation of each servo according to table below:

Stick command	Control surface	Notes
Aileron stick right →	RtAil goes up ↑ LtAil goes up↑	In CAL mode, the ailerons **move up together**
Thr stick forward ↑	RtFlap goes up↑ LtFlap goes up↑	
V-TAIL only: Ele stick forward ↑	RtVee goes up ↑ LtVee goes up ↑	In CAL mode, the elevator(s) operate in **reverse to normal**.
X-TAIL only: Ele stick forward ↑	Ele goes up ↑	
X-TAIL only: Rudder stick right →	Rud goes right →	

To change the direction of an output:

1. Go to the *Direction* field
2. Press {ENTER}, and immediately {EXIT}



Finally, check operation as follows:

- ☐ Exit CAL
- ☐ Enter Cruise mode.
- ☐ Check for correct direction of aileron, elevator and rudder. *Note:* **The flaps cannot be checked yet**.

6.2.2 Adjust end-points and centres

In this section you'll adjust the servo absolute end points and centres. All adjustments are made using curves. **Do not alter *min*, *max* or *subtrim*.**

When setting end-points, consider all the inputs. For example, when setting the flap end points, allow sufficient travel for simultaneous crow and aileron inputs. Otherwise the flaps may stop before the commanded position is reached, resulting in deadband at the stick (this may however be unavoidable).

If you don't know the movements required for your model, then set servo end-points to maximum subject to restrictions below.

Channel	Calibration procedure
☐ CH 4 – Lt Flap	Start by calibrating the left flap. 1. Enter CAL mode 2. Switch **SA** to middle position 3. In the **OUTPUTS** menu, highlight CH4 4. Skip to curve field **LtF**, and press {long ENTER} to open curve editor 5. Throttle stick fully back (↓), adjust point 1 for *lower* end point. Allow for both crow and aileron inputs. 6. Throttle stick fully forward (↑), adjust point 3 for *upper* end point. Allow for any aileron-to-flap mixing. 7. Adjust point 2 so it lies on the straight line between points 1 and 3. 8. Move throttle stick from one end to the other, observing step intervals. You can fine tune point 2 to equalise intervals for best linearity.
☐ CH 3 – Rt Flap	Next, calibrate the right flap (CH3). The goal is to precisely match the left flap. 1. Enter CAL mode 2. **SA** to middle position 3. In the **OUTPUTS** menu, highlight CH3 4. Skip to curve field **RtF**, press {long ENTER} to open curve editor Adjust points 1 – 5 to exactly match the left flap: 5. stick fully back, adjust point 1 6. stick ½-back, adjust point 2 7. stick to centre, adjust point 3 8. stick to ½-forward, adjust point 4 9. stick fully forward, adjust point 5 To match the end points on left and right sides, it may be necessary to reduce one or other end points for the left flap.

Channel	Calibration procedure
☐ Flap offset	Next, adjust the flap offset: 1. Enter CAL mode, switch **SA** down. 2. Open the **GLOBAL VARIABLES** menu. 3. Go to FOf:FM0 4. Adjust offset so that flaps follow airfoil profile Check that the flaps are in line with each other. If not, then redo the calibration of the right flap (see previous step), paying particular attention to the two points either side of the neutral position.
V-Tail ☐ CH 5 – RtVee ☐ CH 6 – LtVee	Calibrate V-tail surfaces: 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH5:RtVee 3. Skip to curve field 'ERv', press {long ENTER} to open curve editor 4. With Ele stick at centre, adjust point 2 for correct neutral 5. Ele stick forward (↑), set point 3 to *upper* limit 6. Ele stick back (↓), set point 1 to *lower* limit. Allow for crow compensation. 7. Repeat for CH6:LtVee, ensuring that movements match CH5:RtVee. 8. Check equal travel up/down; check left and right surfaces match
X-Tail ☐ CH 5 – Ele	*X-tail version only* - Calibrate elevator 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH5 3. Skip to curve field 'ERv', press {long ENTER } to open curve editor 4. With Ele stick at centre, adjust point 2 for correct neutral 5. Move Ele stick forward (↑), then adjust point 3 for *upper* limit 6. Move Ele stick back (↓), then adjust point 1 for *lower* limit 7. Check elevator travel is equal up & down
X-Tail ☐ CH 6 – Rudder	*X- tail version only* - Calibrate rudder 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH6 3. Skip to curve field 'RLv', press {long ENTER } to open curve editor 4. With stick in centre, adjust point 2 so rudder is central 5. Move Rudder stick right (→), then set point 3 for max right movement 6. Move Rudder stick left (←), then set point 1 for max left movement 7. Check equal travel left/right

☐ CH 1 – Rt Ail
☐ CH 2 – Lt Ail
	Finally, calibrate ailerons:
	1. Enter CAL mode
	2. Set switch **SA** to down position. The flaps will go to their calibrated neutrals.
	3. In the **OUTPUTS** menu, highlight CH1:RtAil
	4. Skip to curve field RtA, then press {long ENTER } to open curve editor
	5. With Ail stick at centre, adjust point 2 for correct centre.
	6. Move aileron stick right (→), then set point 3 to desired upper limit. Allow for both crow and aileron movement.
	7. Move aileron stick left (←), then set point 1 so that down-travel = up-travel. If you cannot get sufficient down movement due to geometry, then
	  1. Move **SA** up (↑) – this reduces aileron movement by 50%. *Note:* this reduced rate applies *only in CAL mode*!
	  2. Now try again: Move aileron stick left (←) and adjust point 1 so down-travel = (reduced) up-travel. Full rate will be restored when you exit CAL; don't worry if down-travel is excessive – later adjustments in the **INPUTS** menu, and to aileron diff, will reduce the movement.
	8. Repeat all steps for CH2:LtAil.
	9. Check: (a) equal up/down movement, (b) left and right ailerons match.

- ☐ Exit CAL mode
- ☐ Move the sticks, checking that aileron, elevator and rudder control surfaces move in the correct sense. *Note:* the flaps will cease to respond after exiting CAL mode. They will be configured in the next section.
- ☐ Well done, calibration is complete! Make a backup copy of your work now.

Always do a servo CAL…

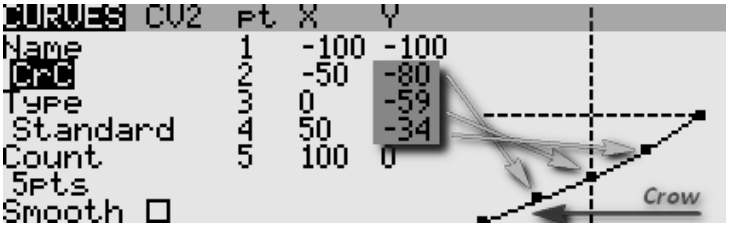
- at the start of a flying session
- after a hard landing
- after swapping out a faulty servo for a new one

7 Configuring inputs and mixers

In this last section, you'll set the control movements and mixing.

Control / mix	Adjustment point	Adjustment procedure
☐ Aileron rate	INPUTS→Ail	Set aileron rate as follows 1. Open the **INPUTS** menu 2. Scroll down to [I]Ail 3. Press {long ENTER} and choose Edit 4. Skip to the weight field 5. Enter Cruise mode 6. Adjust weight for required *up*-aileron movement (down movement is affected by diff setting) 7. If Expo is required, skip to Curve field, choose 'Expo' as the curve type, and set required value in adjacent field. *Note:* Aileron diff is set using the rudder trim; don't use the *Diff* curve type as it will result in asymmetric stick response.
☐ Elevator rate	INPUTS→Ele	As above
☐ Rudder rate	INPUTS→Rud	As above
☐ Aileron→Flap	GVARS→'A2F'	Aileron to flap mixing is set per flight mode. 1. Open **GLOBALVARS** menu, select row 'A2F' 2. Activate flight mode to be adjusted, the column is highlighted 3. Adjust value in highlighted column. *Note:* the movement of down-going flap will be affected by diff setting, adjusted using the rudder trim.
☐ Ail→Rudder	GVARS→'A2R'	This mix can help smooth turns without the need to coordinate rudder and aileron controls. Adjust per flight mode as follows: 1. Open **GLOBALVARS** menu, select row 'A2R' 2. Activate flight mode to be adjusted - the column is highlighted 3. Adjust value in highlighted column
☐ Crow→Ail	GVARS→'CmA'	Sets the upward aileron movement due to crow. 1. Open **GLOBALVARS** menu 2. Enable Landing mode 3. Go to CmA:FM3 4. Move throttle stick back (full crow) 5. Adjust value for required up-aileron movement

Control / mix	Adjustment point	Adjustment procedure
☐ Crow→Flap	GVARS→ 'CmF'	Sets the downward flap movement due to crow. 1. Open **GLOBALVARS** menu 2. Enable Landing mode 3. Go to CmF:FM3 4. Move throttle stick back (full crow) 5. Adjust value for required down-flap movement
☐ Camber→Ail ☐ Camber→Flap	GVARS→ 'CmA' GVARS→ 'CmF'	Camber can be adjusted in Thermal mode using lever **RS**. Adjustment range = +/- 50%. For example if nominal camber is 4 degrees (**RS** at centre), the range will be from 2 to 6 degrees. In this step, you will set nominal camber. Start with flaps: 1. Enable Thermal mode 2. Move **RS** to centre position. 3. Open **GLOBALVARS** menu 4. Go to CmF:FM0 5. Adjust flap camber as required For ailerons, repeat above using CmA:FM0 Check camber range by moving **RS** forward and back.
☐ Reflex→Ail ☐ Reflex→Flap	GVARS→'CmA' GVARS→'CmF'	Reflex can be preset in Speed mode (FM5). Start with flaps: 1. Enable Speed mode 2. Open **GLOBALVARS** menu 3. Adjust reflex in CmF:FM5 Repeat for ailerons using CmA: FM5
☐ Reverse diff	GVARS→ 'RvD'	Reverse diff can improve roll response under braking, by increasing movement of down-going aileron. 1. Enable Landing mode 2. Open **GLOBALVARS** menu 3. Go to RvD: FM3 4. Apply full crow and full aileron 5. Adjust value so that the down-going aileron is at the desired position (normally a little below the neutral position) *Note:* this measure for improving roll response is in addition to aileron diff suppression, which is automatically applied.
☐ Motor→Ele compensation	GVARS→ 'Cmp'	Motor compensation counteracts pitch changes due to motor thrust. It is adjustable in flight via the **thr trim**: • Trim forward → pitch down • Trim centre → zero compensation • Trim back → pitch up Make sure the motor is disconnected while configuring. 1. Open **GLOBALVARS** menu, highlight Cmp:FM2 2. Enable Power mode 3. Push **LS** fully forward (max motor) 4. Move throttle trim fully forward (max down comp) 5. Adjust Cmp:FM2 for required max down compensation 6. Move throttle trim to centre prior to flight tests During test flights: 1. Enter Power mode. 2. Apply minimum power (while still in Power mode), and adjust ***elevator* trim** for level flight. 3. Apply full power and adjust ***throttle* trim** for level flight.

Control / mix	Adjustment point	Adjustment procedure
☐ Crow→Ele compensation	GVARS→ 'Cmp'	Crow compensation is used to counteract pitch changes as crow is applied. It can be fine tuned in flight using the **throttle trim**. • Trim fully back = zero compensation • Trim forward = down compensation First, set the limit of adjustment: 1. Enable Landing mode. 2. Open **GLOBALVARS** menu, highlight Cmp:FM3 3. Apply maximum crow 4. Move **throttle trim** fully forward for max compensation 5. Adjust Cmp:FM3 to set limit of compensation. 6. Move **throttle trim** to recommended compensation. If not known, set trim fully back (zero comp). During flight tests, adjust pitch trim as follows: 1. Enter landing mode 2. Apply *minimum* crow, then adjust **elevator trim**. 3. Apply *full* crow, adjust **throttle trim**. *Note:* After intial flight tests, you can fine-tune the response by editing curve 'CrC'. Alter points 2-4 only. Figure shows compensation rising sharply on initial application of crow, then tailing off towards the maximum (as defined by the throttle trim setting). 

8 Motor safety check

One final safety check.

☐ With the motor disconnected, Enter **CHANNEL MONITOR** menu:

- Taranis: Opening screen, then press {PAGE}x3
- Horus: Opening screen, press {MDL}x2

☐ Check for correct behaviour of the motor channel (CH7:Motor). Practice arming, disarming and applying throttle. Check motor-off = -100, full power = +100.

Congratulations, you've finished setting up your model! Just one last thing….

☐ Back up your EEPROM now!

9 Summary of in-flight adjusters

Target	Adjuster	Flight mode	Notes
Aileron Diff	**Rudder trim**	[Any]	Diff is stored per flight mode Default range is 0 - 70% Trim centre corresponds to 35% diff
Crow→Ele compensation	**Throttle trim**	Landing	Adjust compensation with full crow deployed Trim fully back → zero comp
Motor→Ele compensation	**Throttle trim**	Power	Adjust compensation with motor at full power Trim in centre → zero comp
Aileron Trim	**Aileron trim**	[All]	Aileron trim can be adjusted in any flight mode but is global, i.e. the same trim value is shared by all flight modes.
Elevator trim	**Elevator trim**	[Any]	Elevator trim is stored per flight mode

10 Pre-flight

Before using this setup for the first time, remember to:

- Train your ESC to recognise the motor off/on commands – consult your ESC documentation.
- Set the battery alarm threshold to suit your battery chemistry, for both the tx and rx.
- Set the failsafe so that the motor channel (CH7:Motor) is -100 on loss of signal.

11 Customisations

This section describes various simple customisations. Apply these after the basic setup is complete and backed up. Customisations will not affect mixer adjustments, so you can customise at any time without breaking the setup.

11.1 Changing the assignments of Crow, Motor and Camber

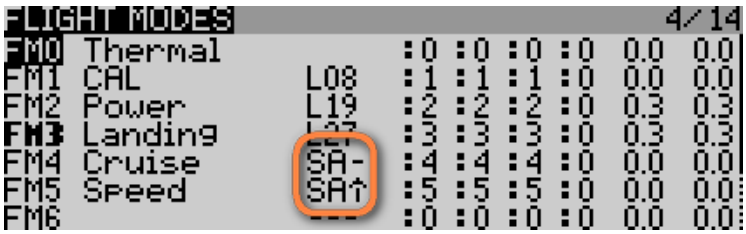
Crow, motor and camber functions may be assigned to any suitable control. Recommended options for the Taranis X9D are as follows:

Function	Assign to	Default	Menu point
Crow	**Thr**, **LS**, or **RS**	**Thr**	Mixers→CH17:RawCro
Motor	**Thr**, **LS**, **RS**, or 3p switch	**LS**	Mixers→CH18:RawMot
Camber	**Thr**, **LS**, **RS**, or 3p switch	**RS**	Mixers→CH20:Camber

11.2 Changing the flight mode switch

By default, the main flight mode switch is **SA**. You can specify another switch Sw instead, as follows:

1. Choose Sw from any 3-position switch (for X9D these are **SA**, **SB**, **SC**, **SD**, **SE** or **SG**).
2. In the FLIGHT MODES menu, set the switches as follows:
   - FM4 (Cruise): **Sw—**
   - FM5 (Speed): **Sw↑**



Note: **Sw↓** will select Thermal mode (you don't set this explicitly).

11.3 Reversing the crow stick

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

1. Open the **MIXERS** menu
2. Skip down to CH17:RawCro
3. Open the mixer editor
4. Change the curve from 'CCt' to '**!**CCt' (note leading exclamation mark).

11.4 Reversing motor lever

By default, motor off (idle) corresponds to **LS** fully back. To alter so that motor off is with **LS** fully forward:

1. Open the **MIXERS** menu
2. Skip down to CH18:RawMot
3. Open the mixer editor
4. Change the curve from 'MCt' to '**!**MCt' (note leading exclamation mark).

Note: this alters the direction of the motor lever only. The idle and full power commands sent to the motor are unchanged.

11.5 Reversing camber lever

To reverse the direction of the camber laver

1. Open the **MIXERS** menu
2. Skip to CH20:Camber
3. Change weight from +25 to -25

11.6 Dual rates

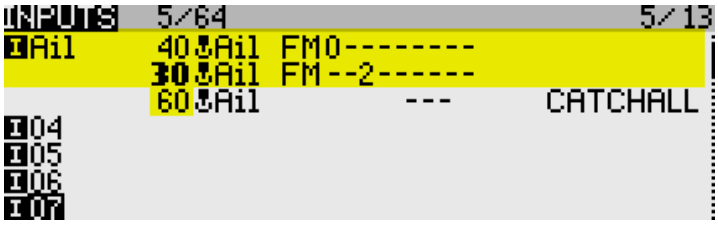
There is no dedicated rates menu in OpenTx. Instead, you add extra lines in the **INPUTS** menu.
For each new rate, create an input, and tick the applicable flight modes, alternatively you can specify a switch. Flight mode numbers as follows:

0: Thermal
2: Power
3: Landing
4: Cruise
5: Speed

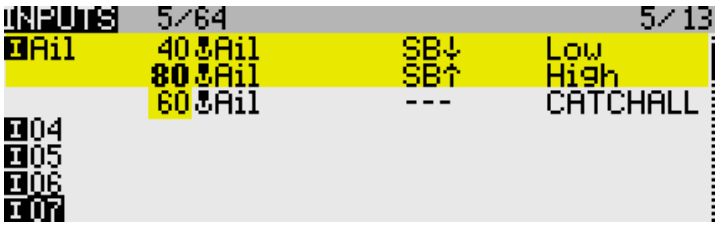
Safety note: The last input must be a 'catchall' with all flight modes enabled, and no switch. This ensures that the control will be active even if no other line is selected.

Below are examples showing triple rates (a) linked to flight-modes and (b) selected by switch:

(a) Aileron rate by flightmode: Thermal (FM0) 40%; Power mode (FM2) 30%; all other flight modes: 60%



(b) Aileron rate by switch: SB↓ 40%; SB↑80%; default (SB—): 60%

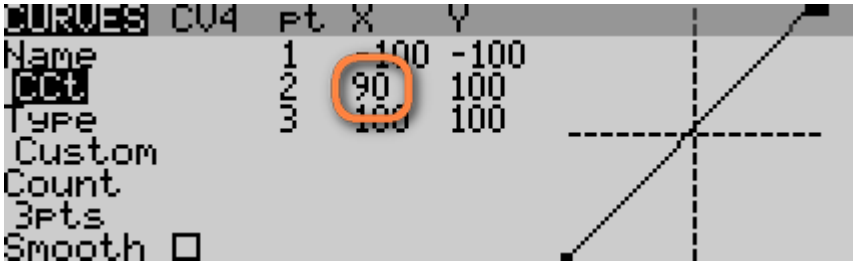


***How OpenTx handles inputs*:** Starting with the first Input line, OpenTx reads the flight mode and/or switch. If these correspond to the actual FM and switch states, OpenTx uses the rate and expo values specified in that line.
If there is no match, OpenTx advances to the next line and repeats the test. The cycle is repeated until either a match is found or the end of the input list is reached. **If no match is found in any line, the control will be inoperative**. As a defence against this possibility, the last line **must** be a 'CATCHALL' with **all flightmodes checked and no switch**.
If both flightmode and switch are specified in the same line, both must match for the line to be active.

11.7 Adjusting crow stick deadband

The crow 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 Curve4:CCt
3. Adjust pt2 -> X. Decrease value to increase the deadband. Default value is 90.



11.8 Selecting an alternative arming method

New in version 3 is the ability to select between three different arming/disarming methods. Selection is by altering the first parameter of logical switches L4 and L5. You can also choose which switch to use. ***Safety note:* If you're not 100% confident with data entry, then stick with the default setup.**

11.8.1 Method 1(default): stick in corner, pull SH

To arm: motor lever off. Full back on elevator stick, full right aileron, pull SH and hold until confirmation
To disarm: pull SH until disarm confirmation
This method is the default, and it works like previous versions of ESP. It is the most secure method, and is recommended for beginners and sport flyers.
Settings: L4: V1 = **L30**
L5: V1 = **L31**
L2: V1= spring switch↓. ***Safety note*: use a spring switch only** (not a regular 2- or 3-p switch).

11.8.2 Method 2: Pull SH

To arm: motor lever off. Pull SH until arming confirmation
To disarm: pull SH until disarming confirmation
This method is better suited if you need to disarm and re-arm in flight.
Settings: L4: V1 = **L35**
L5: V1 = **L36**
L2: V1= spring switch↓. ***Safety note*: use a spring switch only** (not a regular 2- or 3-p switch).

11.8.3 Method 3: Two-position switch

To arm: motor lever off, SF down.
To disarm: SF up
This method offers fast arming/disarming whether on the ground on in the air. At startup, the motor will be disarmed irrespective of the position of SF, so switch checks are not required. **This method is inherently less secure than the first two, and is for experienced flyers only.**
Settings: L4: V1 = **L38**
L5: V1 = **L39**
L3: V1= 2- or 3-pos switch. Default is SF↓

12 Making your own mods

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

13 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 OpenTx.

Remember to test your setup thoroughly before the first flight and after any modifications!

If in doubt, don't fly!!

14 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.

Safe flying!
Mike Shellim