RC-SOAR.com

EasyGee template for OpenTX

Version 1.0

Setup Guide

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1 Introduction

EasyGee is a simple template for electric soarers with dual aileron servos, such as the Multiplex EasyGlider. The emphasis is on ease of use and motor safety. Diff and motor compensation are adjustable in flight, and there is an integrated flight timer.

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

1.1 Package contents

Filename	Description
easygee_10_SetupGuide.pdf	Setup guide
easygee_10_SettingsRef.xls	Settings reference
easygee_10x.otx	Model file
eg***.wav	Sound files

1.2 Requirements

- Any OpenTX 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 2 flight modes: Power, and Cruise.

Flight Mode	OpenTx ID	Activated by	Priority
Power	FM2	Throttle stick forward (motor must be armed)	High
Cruise	FM0		Low

A special CAL flight mode (FM1) is also 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	Motor
Throttle trim	Motor compensation
Rudder trim	Aileron diff
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→ Rud	Motor Comp	Diff
Cruise	Y		Y(**RudTrm**)
Power	Y	Y(**Thr trm**)	Y(**RudTrm**)

1.6 Channel assignments

Channel #	Function
1	Right aileron
2	Left aileron
3	Elevator
4	Rudder
5	Motor
6-13	*[free]*

2 Operational Overview

Flight trims

- Aileron trim is shared across both flight modes
- Elevator trim is shared across both flight modes (but see motor compensation below)
- Rudder and throttle trims are repurposed for other functions (see below)

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**.

Aileron differential

- Aileron diff is adjustable via the **Rudder trim**.
- Diff settings are stored per flight mode.

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. Throttle to idle (**Thr↓)**
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 **Thr↑**

Power mode is activated automatically. *Note*: The throttle stick 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 two CAL sub-modes selected via switch **SA**:

- Mode 1 **(SA↑)**: calibrate with reduced movement for ailerons
- Mode 2 (**SA—, ↓)**: calibrate with normal movement.

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".

Transfer model to transmitter

- □ Launch Companion
- □ Open the easygee_10x.otx file.
- □ From the File menu, choose **READ MODELS AND SETTINGS FROM RADIO**. The models in the radio are displayed in a second window.
- □ Drag the EASYGEE_10x model into an empty slot in the model list.
- □ Close the easygee_10x.otx 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

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 Familiarisation

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

- □ Arming and disarming the motor **with motor disconnected** (see Section 3)
- □ Selecting Cruise and Power 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 up/down and left/right symmetry

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.

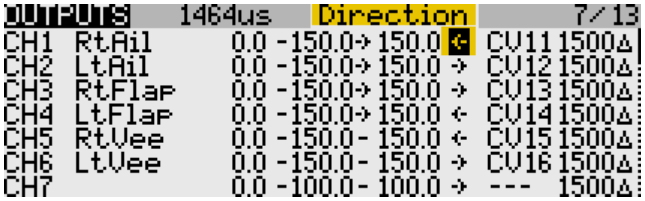
6.2.1 Set servo rotation

- □ Switch on the transmitter (do not power up the receiver yet)
- □ 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**
Ele stick forward ↑	Ele goes up ↑	In CAL mode, the elevator(s) operate in **reverse to normal**.
Rudder stick right →	Rud goes right →	

To change the direction of a control surface:

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.

6.2.2 Adjust servo limits 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*.** Set the servo end-points *to maximum possible* without damaging linkages, while observing constraints described below.

Channel	Calibration procedure
☐ CH 3 – Ele	**Calibrate elevator** 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH3 3. Skip to curve field 'Ele', 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
☐ CH 4 – Rudder	**Calibrate rudder** 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH4 3. Skip to curve field 'Rud', 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 middle position.
	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.
	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:* the reduced movement 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.
☐ 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
☐ 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
☐ Motor→Ele compensation	GVARS→ 'Cmp'	'Motor compensation' is a mix which counteracts pitch changes due to motor thrust. With the motor off, compensation is zero. As motor is increased, the compensation increases to the maximum which is set in GVARS→'Cmp' →FM2. The default is 50% which should be sufficient for most models. Compensation is adjusted in flight using the **throttle trim**. It works like the elevator trim so: • forward → pitch down • centre → zero compensation (default setting) • back → pitch up In flight tests, to adjust pitch trim: 1. In Cruise mode, adjust ***elevator* trim.** 2. Apply full power and adjust ***throttle* trim**. Adjustment is an iterative process!

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 (CH5: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 model now!

9 Summary of in-flight adjusters

Adjuster	Item adjusted	Flight mode	Notes
Rudder trim	Ail differential	[Any]	Diff is stored per flight mode Default range is 0 - 70% Trim centre corresponds to 35% diff
Throttle trim	Motor→Ele compensation	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 (CH5: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 Reversing throttle lever

By default, motor off (idle) corresponds to **Thr** fully back. To alter so that motor off is with **Thr** 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*. The idle and full power commands sent to the motor are unchanged.

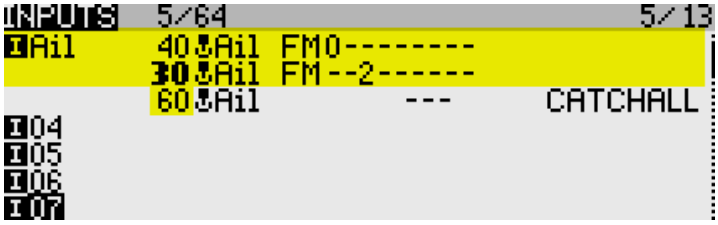
11.2 Multiple control rates

There is no dedicated 'rates' menu in OpenTx. Instead, you add extra lines in the **INPUTS** menu.
For each new rate, create a new input line immediately above the existing CATCHALL line. Tick the applicable flight mode, alternatively you can specify a switch. Flight mode numbers as follows:

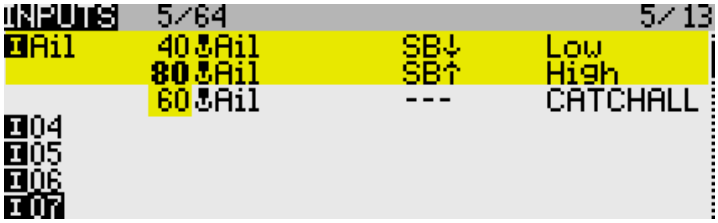
0: Cruise
2: Power

Safety note: The last input must be the '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: Cruise (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.

11.3 Selecting an alternative arming method

There is a choice of three 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.**

11.3.1 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= momentary switch↓. ***Safety note*: use a momentary switch only**.

11.3.2 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= momentary switch↓. ***Safety note*: use a momentary switch only**.

11.3.3 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