

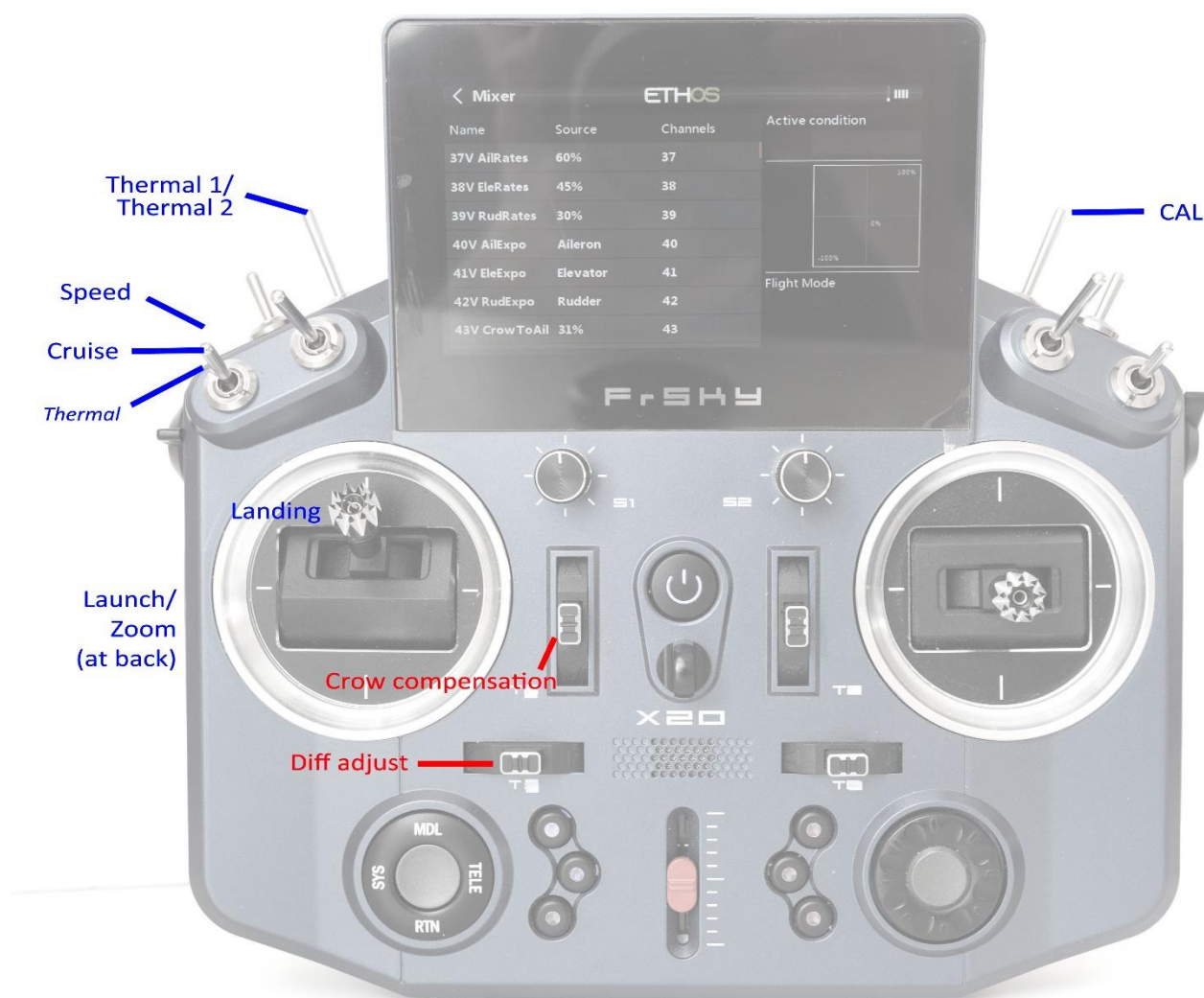
# ***DLG for Ethos***

## ***Template for four-servo DLG's***

**Version 1.0**

## **Setup Guide**

**Mike Shellim**  
4 Sept 2022



# CONTENTS

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1	Introduction .....	2
1.1	Description .....	2
1.2	Package contents.....	2
1.3	Requirements .....	2
2	Overview .....	3
2.1	Stick mode and switch assignments .....	3
2.2	Flight modes .....	3
2.3	Servo assignments .....	3
2.4	Mixer table .....	3
2.5	Flight timer .....	4
2.6	CAL mode .....	4
2.7	Basic operation.....	4
2.8	The flight sequence .....	5
3	Preparing the transmitter .....	5
3.1	Transfer template to transmitter .....	5
3.2	Telemetry .....	5
3.3	Familiarisation .....	5
4	Calibrating the outputs .....	6
4.1	Set servo rotation .....	6
4.2	Adjust servo end points and centres .....	6
5	Configuring travel and mixers .....	8
5.1	Rates (travel) .....	8
5.2	Expo .....	8
5.3	Aileron diff.....	8
5.4	Rudder launch offset .....	8
5.5	Elevator launch offset.....	9
5.6	Brake travel .....	9
5.7	Brake=>elevator ('Compensation').....	9
5.8	Camber/Reflex.....	9
5.9	Elevator => aileron ('Snapflap') .....	9
5.10	Aileron=>Rudder .....	9
6	Flying notes .....	10
6.1	Adjusting pitch trim in landing mode .....	10
7	Customising your setup.....	10
7.1	Changing the main flight mode switch .....	10
7.2	Configuring Thermal 1/thermal 2 mode switch .....	10
7.3	Disabling Thermal 2 .....	10
7.4	Changing the Launch switch .....	11
7.5	Changing the CAL switch .....	11
7.6	Changing the CAL submode switch .....	11
7.7	Reversing the brake stick.....	11
7.8	Launch height announcement.....	11
7.9	Setting diff adjustment range.....	11
7.10	Adjusting brake stick deadband .....	11
7.11	Zoom Safe Exit (ZSE) .....	12
7.12	Making your own modifications .....	12
8	Disclaimer.....	12

# 1 INTRODUCTION

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## 1.1 DESCRIPTION

DLG is a full feature template for four-servo DLGs. It is quick to set up, and fully customisable. Full documentation is provided.

Specification:

### **APPLICATION**

- For DLG gliders with two wing servos
- Any stick mode
- Freely assignable switches

### **LAUNCH HEIGHT CALLOUT**

- Optional launch height callout (using ALT telemetry)

### **7 FLIGHT MODES**

- Launch followed by Zoom
- Cruise, Thermal1, Thermal2, Speed
- Landing
- Voice confirmation

### **IN-FLIGHT ADJUSTERS**

- Adjuster for aileron diff (per FM)
- Adjuster for brake compensation

### **SNAPFLAP**

- Snapflap, preset per flight mode.

### **CONTROL SURFACE CALIBRATION**

- Special 'CAL' mode for quick calibration
- 5-point balancing curve for flaps

### **CROW BRAKE FEATURES**

- compensation adjustment

### **MISC**

- Flight timer
- Aileron to rudder mix
- Channels 7,8,9 free for other functions

Now begin your journey to a great DLG setup! But first, here are the golden rules for success:

- **READ THROUGH THESE INSTRUCTIONS ONCE BEFORE STARTING!**
- **FOLLOW THE INSTRUCTIONS IN SEQUENCE!**

## 1.2 PACKAGE CONTENTS

What's included in the ZIP file:

Filename	Description
dlg100x.bin	Model file
dl1***.wav	Audio files
dlg_ethos_10_SetupGuide.pdf	Setup guide (this document)
dlg_ethos_100_SettingsRef	Settings reference

## 1.3 REQUIREMENTS

The following are required:

- Transmitter running Ethos 1.3.1 or later
- A momentary switch on the correct side, for launching

## 2 OVERVIEW

### 2.1 STICK MODE AND SWITCH ASSIGNMENTS

Any stick mode may be used.

The default switch assignments will suit the X20. *If using a different radio, check that the switches are of the correct type, and re-assign if necessary.*

Function	Switch type	Default	How to re-assign
Main flight mode switch	3-pos	SA	see section 7.1
Launch mode	Momentary	SI	see section 7.4
CAL mode	Momentary	SH	see section 7.5
CAL submode	2- or 3-pos	SA	see section 7.6
Thermal1, Thermal2 modes	2- or 3-pos	SF	see section 7.2
Brakes/landing mode		Throttle stick	[fixed]
Aileron diff adjustment		Rudder trim	[fixed]
Brake compensation adjustment		Throttle trim	[fixed]

### 2.2 FLIGHT MODES

There are 7 flight modes: Launch, Zoom, Cruise, Thermal1, Thermal2, Speed, and Landing.

Launch and Zoom have highest priority. Landing has priority over Thermal, Cruise and Speed.

Flight Mode	ID	Activation switches (defaults shown)	Priority
Launch	FM2	SI↓ (momentary switch)	High
Zoom	FM3	Follows Launch mode. Down elevator to exit	High
Landing	FM4	Throttle stick ↓ (activates brakes)	Mid
Cruise	FM0	SA —	Low
Speed	FM5	SA ↑	Low
Thermal 1	FM6	SA ↓ and SF↑	Low
Thermal 2	FM7	SA ↓ and SF↓	Low

### 2.3 SERVO ASSIGNMENTS

Channel	Function
1	Rudder
2	Elevator
3	Left aileron
4	Right aileron

The left and right channels are not interchangeable – *please ensure they are connected correctly!*

### 2.4 MIXER TABLE

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

Flight mode	Diff	Ail=> Rud	Brakes	Brake Comp	Rudder offset	Camber/ Reflex	Snapflap
Launch	✓ (Rud trim)	✓			✓	✓	✓
Zoom	✓ (Rud trim)	✓				✓	✓
Landing	✓ (Rud trim)	✓	✓	✓ (Thr trim)		✓	✓
Thermal1/2	✓ (Rud trim)	✓				✓	✓
Speed	✓ (Rud trim)	✓				✓	✓
Cruise	✓ (Rud trim)	✓				✓	✓

## 2.5 FLIGHT TIMER

Timer1 acts as a flight timer.

- *To reset and start:* release Launch switch
- *To stop:* pull and hold Launch switch

## 2.6 CAL MODE

CAL is a special flight mode for calibrating the outputs. It allows precise adjustment of aileron tracking. When CAL is activate, stick values are passed directly to the outputs.

To activate CAL mode:

1. Apply full left aileron and full up elevator, and hold.
2. Pull and release SH
3. Release sticks.
4. Listen for voice confirmation.
5. Select the appropriate submode ('calibration' or 'calibrate flap neutral').

Sub mode	Switch	Description
Calibration	SA— or SA↑	for calibrating end points and centres. <b><i>The ailerons move in 25% increments.</i></b>
Calibrate flap neutral	SA↓	for calibrating the aileron neutral offset

To exit CAL mode, pull SH.

## 2.7 BASIC OPERATION

### Trims

- Aileron trim is shared across all flight modes.
- Elevator trim is independent per flight mode.
- Rudder trim is repurposed to adjust differential, per flight mode.
- Throttle trim is repurposed to adjust brake compensation (Landing mode only)

### Launch offsets

- The rudder launch offset is preset
- The elevator launch offset is adjusted using the elevator trim

### Aileron differential

- Aileron diff is adjustable using the rudder trim, per flight mode

### Camber presets

- Camber/reflex is preset per flight mode

### Brake compensation (brake=>elevator mix)

- The compensation at full brake can be adjusted in flight, via the throttle trim.
- The compensation with partial brake can be tuned via a curve.

### Aileron=>rudder mix

- Aileron=>rudder mix is preset, per flight mode.

### Snapflap

- Snapflap (elevator=> ail) is preset, per flight mode.

## 2.8 THE FLIGHT SEQUENCE

The flight sequence is as follows:

1. Rotate the model whilst pulling the launch switch. Model is in Launch mode.
2. As the model leaves the hand, release the launch switch. Model enters Zoom mode.
3. Near the top of the climb, **push forward on the elevator stick**. Model exits Zoom mode.
4. Once out of Zoom mode, the flight mode is determined by flight mode switch and throttle stick.

## 3 PREPARING THE TRANSMITTER

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### 3.1 TRANSFER TEMPLATE TO TRANSMITTER

Start by transferring the template to your transmitter:

#### Establish a USB connection

1. Enter Bootloader mode.
2. Connect to PC via USB. The tx's SD card should appear as an external drive.

#### Copy files

1. Unzip file *dlg-ethos-100.zip* into a directory on your local drive
2. Copy the audio (.wav) files to the **SD card:\audio** folder (*not* the language subfolder).
3. Copy the model file *dlg100x.bin* to the **SD card:\models** folder
4. Terminate the USB connection and restart the transmitter.
5. Activate model 'DLG v100'

### 3.2 TELEMETRY

With the receiver bound and powered, check that your transmitter is receiving telemetry. If you encounter problems, try rediscovering your sensors as follows:

1. Open the **TELEMETRY** menu
2. Choose 'Delete all'
3. Choose 'Discover new sensors'

### 3.3 FAMILIARISATION

Using the transmitter on its own, practise the following:

- Activate Launch, Zoom, Thermal1, Thermal2, Cruise, Speed and Landing modes (see Section 2.2).  
**TIP:** start with the throttle stick pushed fully forward.
- Activate CAL mode and sub-modes (see Section 2.6)
- Start/stop/reset the flight timer (see Section 2.5)
- Verify that the sounds are working correctly. If not, check that the sound files are in the correct location.

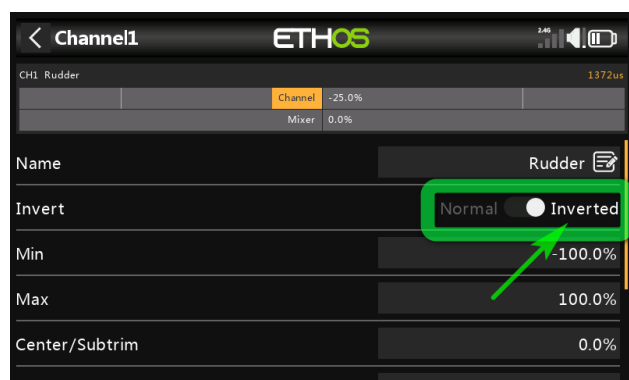
## 4 CALIBRATING THE OUTPUTS

In this section you will set the operating range of the servos.

### 4.1 SET SERVO ROTATION

First, check and adjust servo rotation:

1. Switch on the transmitter (do not power up the receiver yet)
2. Move the aileron, elevator and rudder sticks (note: *the throttle stick will have no effect*).
3. If a servo moves in the wrong direction, open the Outputs menu, and invert the channel:



### 4.2 ADJUST SERVO END POINTS AND CENTRES

The next task is to set the operating limits of the servos, and to precisely match the ailerons. **All adjustments are made in CAL mode.**

Note:

- The channel limits should be set the maximum possible (limited by linkage geometry).
- Adjustments are made using curves - leave *Min*, *Max* and *Subtrim* at their default values.
- With Ethos (unlike the OpenTX version), you will need to experiment to see which of two points to adjust. The alternative points are shown in brackets (). Try the first point, if nothing happens use the alternative.

Channel	Calibration procedure
CH 1 – Rudder	<p>Calibrate the rudder channel</p> <ol style="list-style-type: none"><li>1. Activate CAL mode</li><li>2. Open the <b>OUTPUTS</b> menu</li><li>3. Highlight the rudder channel (default CH1)</li><li>4. Scroll down to <i>Curve</i> field, choose <i>Edit</i></li><li>5. With Rudder stick in centre, adjust point 2 so rudder is centred</li><li>6. Move stick right (→), then set point 3 (or 1) for max possible right movement</li><li>7. Move stick left (←), then set point 1 (or 3) for max left movement</li><li>8. Check equal travel left/right, reduce one or other side as necessary.</li></ol>

Channel	Calibration procedure
CH 2 – Elevator	<p>Calibrate the elevator channel.</p> <p><b>!!! IMPORTANT: in CAL mode, the elevator moves in the opposite direction to normal !!!</b></p> <ol style="list-style-type: none"> <li>1. Activate CAL mode</li> <li>2. Open the <b>OUTPUTS</b> menu</li> <li>3. Highlight the elevator channel (default CH2)</li> <li>4. Scroll down to <i>Curve</i> field, choose <i>Edit</i></li> <li>5. With Ele stick at centre, adjust point 2 so elevator is central</li> <li>6. Move stick forward (↑), then adjust point 3 (or 1) for <i>upper</i> limit</li> <li>7. Move stick back (↓), then adjust point 1 (or 3) for <i>lower</i> limit</li> <li>8. Check elevator travel is equal up &amp; down, reduce one or other side as necessary.</li> </ol>
<input type="checkbox"/> CH 3 – Lt Ail	<p>Calibrate the left aileron:</p> <ol style="list-style-type: none"> <li>1. Activate CAL mode, select 'Calibration' submode</li> <li>2. Open the <b>OUTPUTS</b> menu</li> <li>3. Highlight left aileron channel (default CH3)</li> <li>4. Scroll down to the <i>Curve</i> field, choose <i>Edit</i></li> <li>5. Throttle stick fully back (↓), adjust point 1 (or 3) for <i>lower</i> end point.</li> <li>6. Throttle stick fully forward (↑), adjust point 3 (or 1) for <i>upper</i> end point.</li> </ol>
<input type="checkbox"/> CH 4 – Rt Ail	<p>Next, calibrate the right aileron so it precisely matches the left aileron:</p> <ol style="list-style-type: none"> <li>1. Activate CAL mode, select Calibration submode (switch SA—)</li> <li>2. Open the <b>OUTPUTS</b> menu</li> <li>3. Highlight the right aileron channel (default CH4)</li> <li>4. Scroll down to the <i>Curve</i> field, and press <i>Edit</i></li> </ol> <p>Adjust points 1 – 5 to exactly match the left aileron:</p> <ol style="list-style-type: none"> <li>5. Stick fully back, adjust point 1 (or 5)</li> <li>6. Stick ½-back, adjust point 2 (or 4)</li> <li>7. Stick to centre, adjust point 3 (or 3)</li> <li>8. Stick to ½-forward, adjust point 4 (or 2)</li> <li>9. Stick fully forward, adjust point 5 (or 1)</li> </ol> <p>To match the end points on left and right sides, it may be necessary to reduce one or other end points for the left aileron.</p>
Aileron offset	<p>Next, calibrate the aileron offset:</p> <ol style="list-style-type: none"> <li>1. Activate CAL mode</li> <li>2. Select submode 'calibrate aileron neutral' (switch SA↓)</li> <li>3. Page to <b>MIXER</b> menu.</li> <li>4. Scroll to mixer <b>V_AilNeutral</b>, and open the mix editor</li> <li>5. Adjust <i>weight</i> so that ailerons follow the neutral profile</li> </ol> <p>If ailerons are not precisely aligned, redo the calibration of the left aileron (see above), paying attention to the points either side of the neutral position.</p>

Check operation:

1. Exit CAL mode
2. Check that aileron, elevator and rudder control surfaces move in the correct sense. **Note that the throttle stick will not function yet.**

Don't worry if there's too much movement– it'll be reduced in the next section.



## 5 CONFIGURING TRAVEL AND MIXERS

In the final section, you'll set the control travel and mixers. All settings are stored in VAR mixes - these are all grouped at the top of the mixer list. Adjustments are made via the *Weight* field.

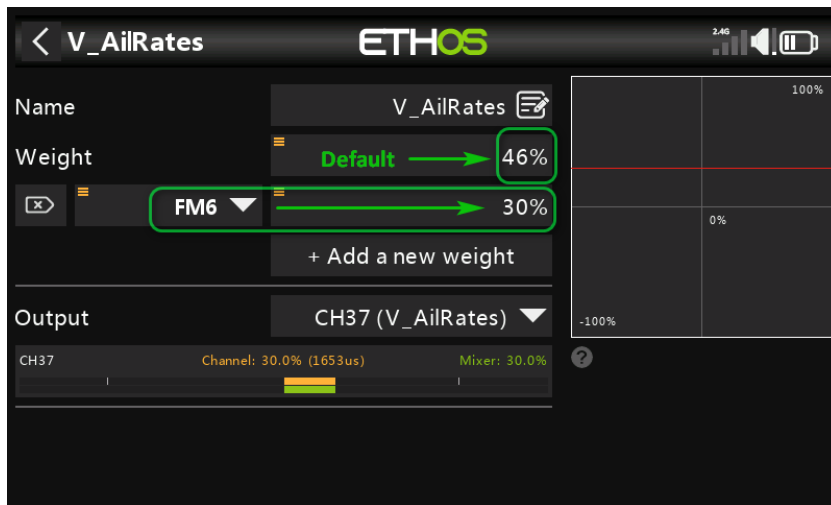
### 5.1 RATES (TRAVEL)

Control travel is set in the following VAR mixes:

- **V\_AilRates** – for aileron rate. Upward movement only (down movement is adjusted via Diff).
- **V\_EleRates** – for elevator rate
- **V\_RudRates** - for rudder rate

The first value is the default rate. Extra lines may be added for FM-specific rates.

**SAFETY:** *always ensure that the default rate provides sufficient control. **Never set it to zero!***



### 5.2 Expo

Expo is adjusted in the following VAR mixes:

- **V\_AilExpo** – for aileron expo
- **V\_EleExpo** – for elevator expo
- **V\_RudExpo** – for rudder expo

The first weight is the default. Add FM-specific expo the same way as for control rates.

### 5.3 AILERON DIFF

Aileron differential ('diff') determines the relative amount of aileron down travel. The more diff, the less down travel. Diff is adjustable in flight using the rudder trim.

- Trim fully left: down-travel = 30%
- Trim centre: down-travel = 80%
- Trim full right: down travel = 130% (more down than up!)

The adjustment is flight mode dependent - *remember to adjust diff for each flight mode!*

### 5.4 RUDDER LAUNCH OFFSET

Counteracts rotation of the model following launch. Adjust in mix **V\_RudOffset**

## 5.5 ELEVATOR LAUNCH OFFSET

Activate Launch mode and adjust the elevator trim.

## 5.6 BRAKE TRAVEL

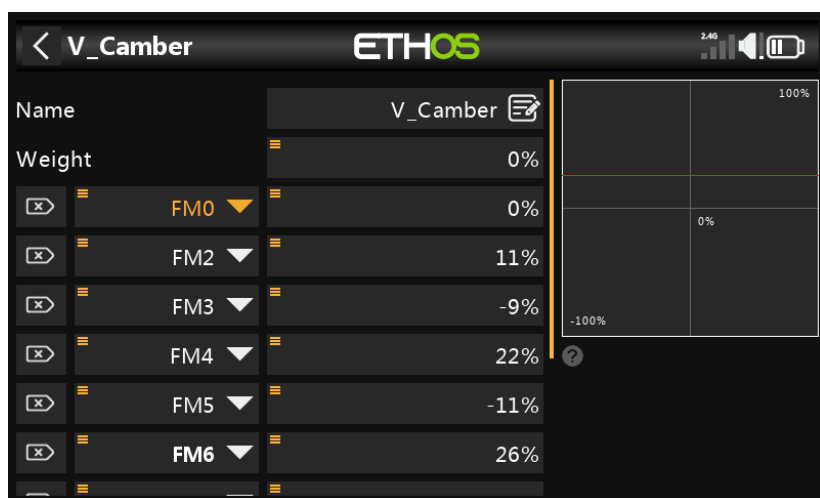
The aileron travel due to brakes is adjusted in mix **V\_BrakeTravel**. Adjust this with full brakes deployed.

## 5.7 BRAKE=>ELEVATOR ('COMPENSATION')

Brake compensation is adjusted in flight using the throttle trim (see section 6.1). The maximum is set in **V\_MaxBrComp** - the default is 80% of available down-elevator travel and should not need adjusting.

## 5.8 CAMBER/REFLEX

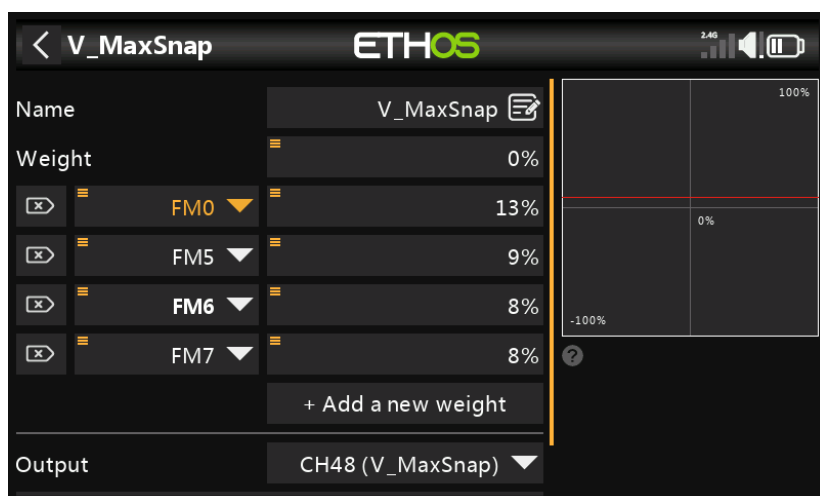
Camber presets are stored in mix **V\_Camber**. The first line is the default (= zero). Other values can be added for individual flight modes. When adjusting, activate the target flight mode first – the active line is highlighted in **bold**.



## 5.9 ELEVATOR => AILERON ('SNAPFLAP')

Snapflap is set in mix **V\_MaxSnap**.

The first value is the default (zero). FM specific values can be added for Cruise, Speed, Thermal1 and Thermal2. When adjusting, activate the target flight mode first – the active line is highlighted in **bold**.



## 5.10 AILERON=>RUDDER

This mix can help with entry into turns. The strength is set in mix **V\_AilToRud**. The default is zero. Adjust as for Camber above.

## 6 FLYING NOTES

### 6.1 ADJUSTING PITCH TRIM IN LANDING MODE

Pitch trim in Landing mode is made up of two elements: the base trim (fixed), and the brake compensation (variable). To adjust the trim in flight, follow this sequence:

1. First, adjust base trim: apply approximately 5% brake (just enough to enter Landing mode) – then adjust pitch using the **elevator** trim.
2. Next, adjust compensation. Apply 100% brake, then adjust pitch using the **throttle** trim:
  - Throttle trim back = zero compensation
  - Throttle trim forward = max compensation (80% down elevator with max brake)

If necessary, you can fine tune the compensation by editing curve CV7:BrC. *Alter points 2 – 4 only.* The default curve is a typical 'S' shape which will suit most models.

## 7 CUSTOMISING YOUR SETUP

This section describes how to customise your setup. You can customise at any time.

### 7.1 CHANGING THE MAIN FLIGHT MODE SWITCH

A 3-position switch is used to select Cruise, Speed, and Thermal1/2. The assignments are defined in two logical switches as follows:

Function	Menu point	Assign to	Default
Speed mode	LOGICALSWITCHES→SW_FM_SPEED→Value1	3-pos switch	SA↑
Thermal mode	LOGICALSWITCHES→SW_FM_THERMAL→Value1		SA↓

The same 3-position switch must be used in both lines.

The third (unassigned) position activates Cruise mode.

### 7.2 CONFIGURING THERMAL 1/THERMAL 2 MODE SWITCH

By default, two alternative thermal modes are available Thermal\_1 and Thermal\_2. The selection switch can be 2- or 3-position (default SF). To change the switch, edit logical switch as follows:

Function	Menu point	Assign to	Default
Thermal_2 select	LOGICALSWITCHES→SW_TH2→Value1	2- or 3-pos switch	SF↓

The remaining switch position(s) select Thermal 1.

### 7.3 DISABLING THERMAL 2

If you prefer, you can completely disable thermal\_2. In that case, only thermal\_1 is available.

Function	Menu point	Value	Default
Thermal 2 enable	MIXER→V_Therm2Enable→weight	0 = disabled 1 = enabled	Enabled

If Thermal\_2 mode is disabled:

- the Thermal1/Thermal2 mode switch is no longer used and can be reassigned for other purposes.
- you may wish to change the sound file for Thermal\_1 to say just 'thermal' or 'slow' - alternative WAV files are provided in the package, assign in the **SPECIAL FUNCTIONS** menu=>SF8.

## 7.4 CHANGING THE LAUNCH SWITCH

To change the switch for Launch mode, edit a logical switch as follows:

Function	Menu point	Assign to	Default
Launch mode	LOGICALSWITCHES→MOM_LAUNCH→Value1	Any momentary switch	SI↓

**SAFETY:** The switch must be a momentary type, do not use a regular switch!

## 7.5 CHANGING THE CAL SWITCH

To change the CAL mode switch, edit a logical switch as follows:

Function	Menu point	Assign to	Default
CAL switch	LOGICALSWITCHES→MOM_CAL→Value1	Any momentary switch	SH↓

**SAFETY:** The switch must be a momentary type, do not use a regular switch!

## 7.6 CHANGING THE CAL SUBMODE SWITCH

The CAL submode switch selects between 'normal' and 'aileron neutral' modes. To change the switch, edit a logical switch as follows:

Function	Menu point	Assign to	Default
CAL Submode switch	LOGICALSWITCHES→SW_CAL_NEUTRAL→Value1	Any 2- or 3-pos switch	SA↓

## 7.7 REVERSING THE BRAKE STICK

By default, zero brake is with the throttle stick forward. To reverse the stick:

1. Open the **MIXER** menu
2. Go to mixer ThrWDeadband
3. In the source field, long press and check the *Negative* option.

Zero brake now corresponds to the bottom of stick travel.

## 7.8 LAUNCH HEIGHT ANNOUNCEMENT

Launch height is the difference between the height at launch, and the maximum height achieved until 3 seconds after exiting Zoom mode.

Announcement of launch height requires altitude telemetry. Configure as follows:

Function	Menu point	Note
Callout enable	SPECIAL FUNCTIONS→SF10	<i>Disabled: State=Disabled</i> <i>Enabled: State=Enabled, Value=Telemetry→Altitude</i>
Callout delay	LOGICAL SWITCHES→ EXIT_ZOOM_DELAY→During	Default=3secs

## 7.9 SETTING DIFF ADJUSTMENT RANGE

The default range of diff adjustment is -30% to +70%. It can be changed by editing the end points of curve 'DiffRng'.

## 7.10 ADJUSTING BRAKE STICK DEADBAND

The brake stick incorporates some deadband to prevent accidental deployment. The amount of deadband can be adjusted as follows:

Function	Menu point	Value	Default
Brake stick deadband	CURVES→ThrDb	Set point 2→X for required deadband	85

## 7.11 ZOOM SAFE EXIT (ZSE)

With the default configuration, the pilot must ensure that the brake stick is in the 'off' position before exiting Zoom mode, otherwise the brakes will deploy suddenly on exit from Zoom.

Zoom Safe Exit (ZSE) is an optional interlock which prevents this. When ZSE is enabled, the brake stick must be in the 'off' position in order to exit Zoom mode. If the brake stick is not in the off position, then the model will remain in Zoom mode.

ZSE is disabled by default. It can be enabled in logical switch ZOOM\_RESET, by changing the *Active condition* field to logical switch IS\_BR\_OFF

Function	Menu point	Logical switch	Default
Zoom Safe Exit	LOGICAL SWITCHES → ZOOM_RESET	<i>Disabled:</i> Active condition = AlwaysOn <i>Enabled:</i> Active condition = Log switch: IS_BR_OFF	Disabled

## 7.12 MAKING YOUR OWN MODIFICATIONS

If you want to make your own modifications, please study the Excel documentation and make sure you understand the implications of any changes. Recommended workflow as follows:

- Set up your model as described in this guide.
- Backup your work
- Apply your modifications incrementally, testing and backing up as you go along.

## 8 DISCLAIMER

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Although this setup is well 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 Ethos.

***Test your setup thoroughly before the first flight and after any modifications!***

***If in doubt, don't fly!!***

If you find any errors in this document, or have any queries, you can contact me via <http://rc-soar.com/email.htm>. For technical queries, please provide the following information:

- Transmitter type
- Ethos version
- DLG template version

Safe flying!

- Mike Shellim