

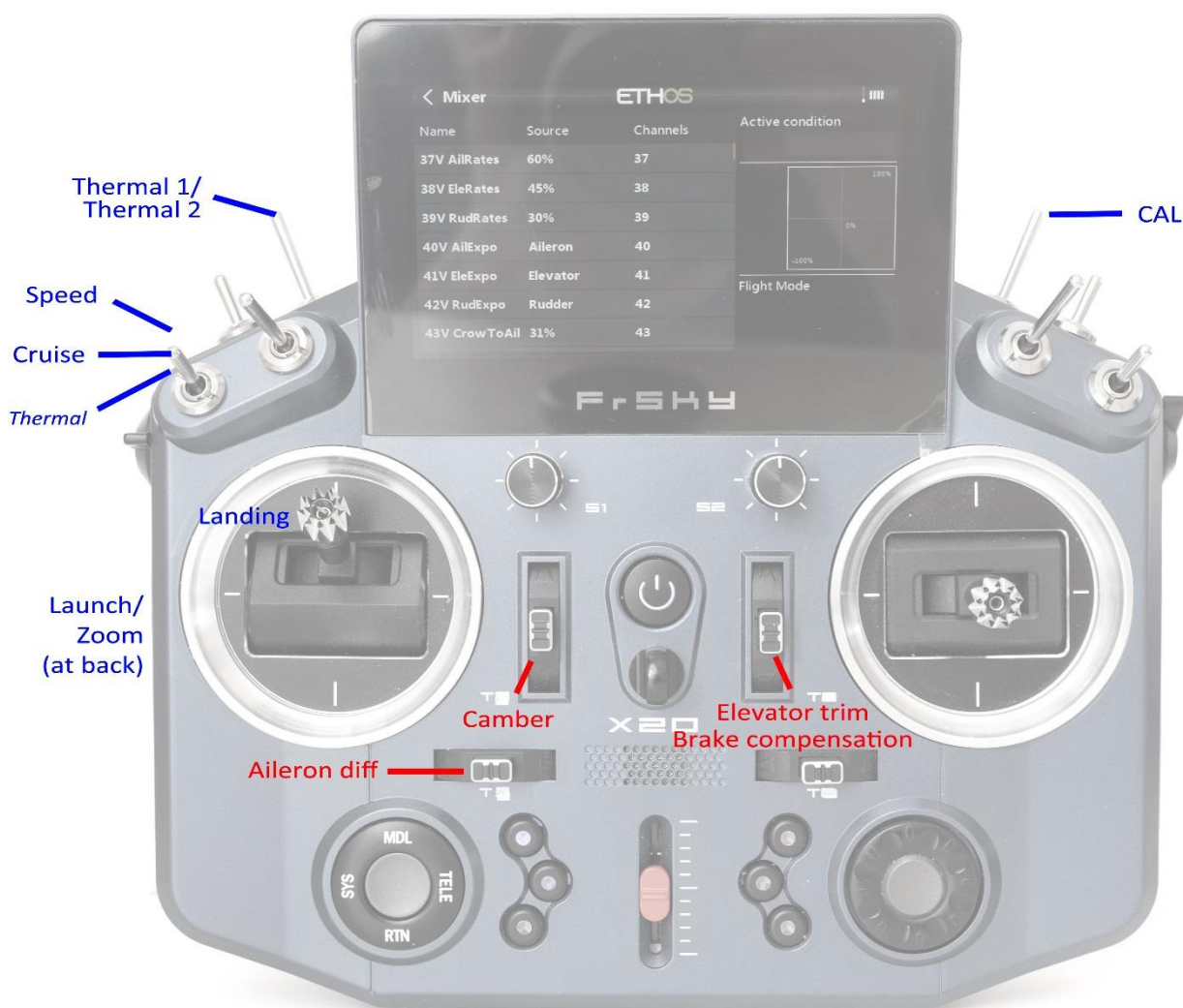
DLG for Ethos

Template for four-servo DLG's

Version 2.1 for Ethos 1.5

Setup Guide

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30 August 2024



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1 INTRODUCTION

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)
- Brake compensation

SNAPFLAP

- Snapflap, preset per flight mode.

CONTROL SURFACE CALIBRATION

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

LANDING BRAKES

- brake-aware adaptive trim
- automatic suppression when exiting Zoom
- negative diff option for increased roll response

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!**
- **IF YOU HAVE PROBLEMS, PLEASE VISIT THE [SUPPORT PAGE](#)**

1.2 PACKAGE CONTENTS

What's included in the ZIP file:

Filename	Description
dlg21^x.bin	Model file
dl1***.wav	Audio files
dlg_ethos_21_SetupGuide.pdf	Setup guide (this document)
dlg_ethos_21^_SettingsRef	Settings reference

1.3 REQUIREMENTS

The following are required:

- Transmitter running Ethos, see [release notes](#) for the version of Ethos required. (If you've forgotten the full version number of your template, open the Outputs menu and scroll to CH64. The version number is stored in the channel name.)

2 OVERVIEW

2.1 STICK MODE AND SWITCH ASSIGNMENTS

Any supported 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 7.5
CAL mode	Momentary	SH	see section 7.6
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	[n/a]
Aileron diff adjustment		Rudder trim	[n/a]
Brake compensation adjustment		Elevator trim	[n/a]

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!*

Left and right are from the point of view of an observer looking forwards from the tail.

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)	✓	✓	✓ (Ele 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:* press and hold Launch switch

2.6 CAL MODE

CAL is a special flight mode for (a) calibrating servo limits and centres, and (b) balancing left and right ailerons. In CAL mode, stick values are passed directly to the outputs, so you can visualise the full range of servo movement.

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. <i>The ailerons move in 25% steps, to facilitate tracking adjustment.</i>
Calibrate flap neutral	SA↓	for calibrating the aileron neutral offset

To exit CAL mode, pull SH.

Note: In CAL mode, the aileron stick has no effect.

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 adjusts camber/reflex

Rudder offset

- The rudder launch offset is preset

Aileron differential

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

Camber presets

- Camber/reflex is adjusted via the throttle trim, per flight mode

Brake compensation (brake=>elevator mix)

- Brake compensation is adjusted in flight via the elevator trim (brake-aware adaptive trim)

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 activating 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.

2.9 ZOOM SAFE EXIT

Zoom Safe Exit prevents the brakes from suddenly deploying when exiting Zoom mode.

When exiting Zoom mode, a warning sounds if the brake stick is not in the home position. The brakes will remain retracted, and the next lower priority flight mode will be selected (Cruise, Thermal1, Thermal2, or Speed).

The brake stick will be active again after it's returned to the home position.

3 PREPARING THE TRANSMITTER

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

'^' refers to minor version number

1. Unzip file *dlg-ethos-21^.zip* into a directory on your local drive
2. Select all the .wav files in the zip file, and copy to the **voice1** folder in the SD Card. To determine the voice1 folder, open the **SYSTEM>GENERAL** menu on your transmitter, and scroll to the 'Audio' section.
Example: if voice1='gb', copy .wav files to folder SD:\audio\en\gb. *Do not copy to the 'system' sub-folder!*
3. Copy the file *dlg21^x.bin* to SD:\models folder
4. Terminate the USB connection and restart the transmitter.
5. Activate model 'DLG v21^X'. If the model is not visible, check required minimum Ethos version is installed.

3.2 TELEMETRY

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

1. Open the **TELEMETRY** menu
2. Choose 'Delete all', then '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. If not, check that the sound files are in the correct location.

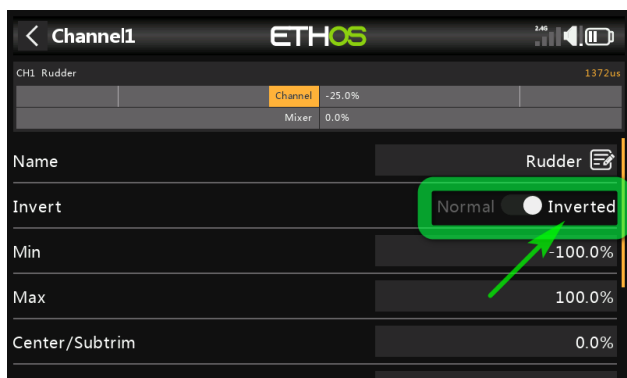
4 CALIBRATING THE OUTPUTS

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 alone - 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.
- The aileron stick has no effect in CAL mode.

Channel	Calibration procedure
CH 1 – Rudder	<p>Calibrate the rudder channel</p> <ol style="list-style-type: none">1. Activate CAL mode2. Open the OUTPUTS menu3. Highlight the rudder channel (default CH1)4. Scroll down to <i>Curve</i> field, choose <i>Edit</i>5. With Rudder stick in centre, adjust point 2 so rudder is centred6. Move stick right (→), then set point 3 (or 1) for max possible right movement7. Move stick left (←), then set point 1 (or 3) for max left movement8. Check equal travel left/right, reduce one or other side as necessary.

Channel	Calibration procedure
CH 2 – Elevator	<p>Calibrate the elevator channel.</p> <p>!!! IMPORTANT: in CAL mode, the elevator moves in the opposite direction to normal !!!</p> <ol style="list-style-type: none"> 1. Activate CAL mode 2. Open the OUTPUTS menu 3. Highlight the elevator channel (default CH2) 4. Scroll down to <i>Curve</i> field, choose <i>Edit</i> 5. With Ele stick at centre, adjust point 2 so elevator is central 6. Move stick forward (↑), then adjust point 3 (or 1) for <i>upper</i> limit 7. Move stick back (↓), then adjust point 1 (or 3) for <i>lower</i> limit 8. Check elevator travel is equal up & down, reduce one or other side as necessary.
<input type="checkbox"/> CH 3 – Lt Ail	<p>Calibrate the left aileron:</p> <ol style="list-style-type: none"> 1. Activate CAL mode, select 'Calibration' submodule 2. Open the OUTPUTS menu 3. Highlight left aileron channel (default CH3) 4. Scroll down to the <i>Curve</i> field, choose <i>Edit</i> 5. Throttle stick fully back (↓), adjust point 1 (or 2) for <i>lower</i> end point. 6. Throttle stick fully forward (↑), adjust point 2 (or 1) for <i>upper</i> end point.
<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"> 1. Activate CAL mode, select Calibration submodule (switch SA—) 2. Open the OUTPUTS menu 3. Highlight the right aileron channel (default CH4) 4. Scroll down to the <i>Curve</i> field, and press <i>Edit</i> <p>Adjust points 1 – 5 to exactly match the left aileron:</p> <ol style="list-style-type: none"> 5. Stick fully back, adjust point 1 (or 5) 6. Stick ½-back, adjust point 2 (or 4) 7. Stick to centre, adjust point 3 (or 3) 8. Stick to ½-forward, adjust point 4 (or 2) 9. Stick fully forward, adjust point 5 (or 1) <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"> 1. Activate CAL mode 2. Select submodule 'calibrate aileron neutral' (switch SA↓) 3. Page to VARS menu. 4. Scroll to V_AilNeutral, and open the Vars editor 5. Adjust the number in the <i>values</i> field, until the ailerons follow the airfoil profile. <p>If the ailerons are not precisely aligned with each other, 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. Don't worry if there's too much movement— it'll be reduced in the next section.

Note that the throttle stick/brakes will not function yet – these are configured in the next section.

5 CONFIGURING TRAVEL AND MIXERS

In the final section, you'll set the control travel and mixers. All adjustments are made in the VARs menu (*new in Ethos 1.5*). Values are stored in the *Values* field.

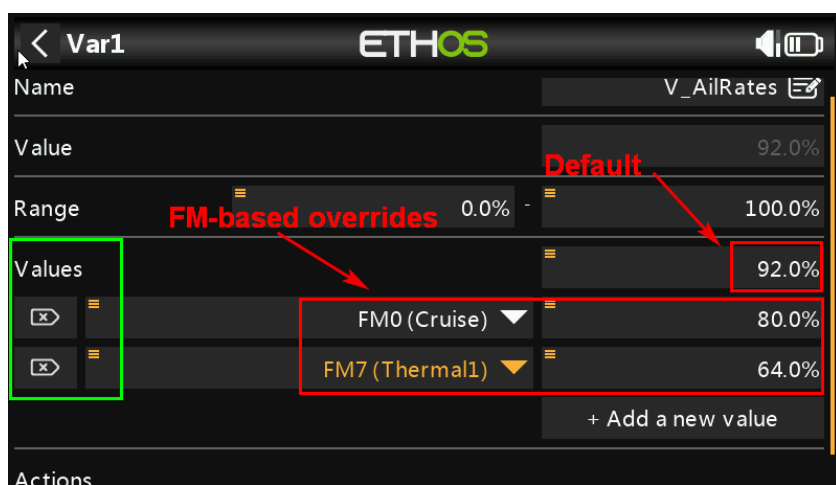
5.1 RATES (TRAVEL)

Control travel is set in the following VARs:

- **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. To add a line, click on the 'add' icon, and choose category 'Flight modes'. Then select the flight mode.

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 value is the default. Add FM-specific expo the same way as for Rates above.

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 set diff for each flight mode!*

5.4 RUDDER LAUNCH OFFSET

Counteracts rotation of the model following launch. Adjust in VAR **V_RudOffset**

5.5 ELEVATOR LAUNCH OFFSET

There's no special setting – just activate **Launch** mode and adjust the elevator trim.

5.6 BRAKE TRAVEL

The aileron travel due to brakes is adjusted in VAR **V_BrakeTravel**. Ensure that brakes are fully deployed while adjusting (enter **Landing** mode, and pull the throttle lever to the down position).

5.7 BRAKE COMPENSATION ('BRAKE AWARE' TRIM)

When applying brakes, pitch corrections are derived from a brake=>elevator mix. To deal with non-linear corrections needed, the mix has a 5-point compensation curve.

Version 2.1 introduces an easy method of adjusting the compensation. Instead of having to land each time to alter points on the curve, adjustment is via the regular elevator trim. The curve points are selected automatically according to the amount of brake being applied.

The process is completely transparent, no looking at the screen required. This makes it easy to trim out the brakes *in flight* and *throughout their range of travel*!

To familiarise yourself with the system, go to the Curves menu and highlight the BrakeComp curve. Then apply some brake. Now move the elevator trim forward and back and notice how the curve changes. Note that the last point on the curve (immediately after transitioning into **Landing** mode) is fixed and does not respond to the trim.

Technical note: at transition into **Landing** mode, the elevator trim value is inherited from **Cruise** mode. This constitutes the 'base' trim. As more brake is applied, the (variable) compensation is added to the base trim to give the final elevator offset.

5.8 NEGATIVE DIFF

Negative diff can improve aileron response under braking. As brakes are applied, the travel of the *upgoing* aileron is increased by an amount set in **V_NegDiffLand**. Adjust with full brakes and full aileron. Apply sparingly!

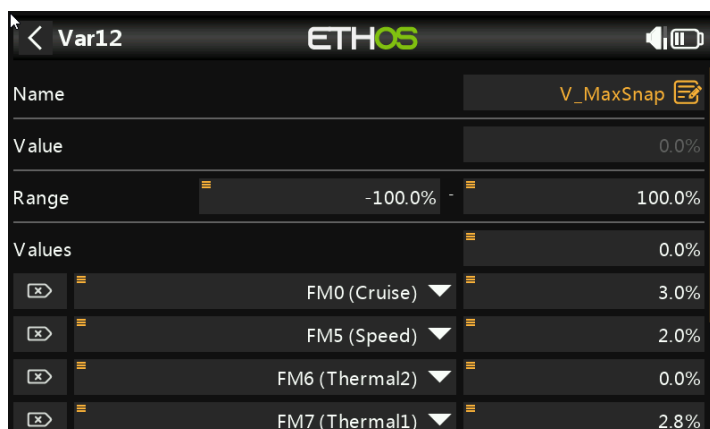
5.9 CAMBER/REFLEX (NEW IN 2.1)

Camber and reflex are adjusted using the throttle trim. Settings are store individually per flight mode. Trim centre=zero camber, trim back = +ve camber, trim forward = -ve camber (reflex). The range of adjustment is set in **V_MaxCamber** – the default is +/- 35% of flap travel, and should not need altering.

5.10 ELEVATOR => AILERON ('SNAPFLAP')

Snapflap is set in **V_Snapflap**.

The first value is the default and should be 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 then highlighted in **bold**.



5.11 AILERON=>RUDDER

This mix can help with entry into turns, and is especially useful with brakes deployed. Adjust in **V_AilToRud**. The default is zero. Adjust in the same way as for Snapflap (section 5.10).

6 TRIMMING NOTES

6.1 ADJUSTING PITCH TRIM WITH BRAKES (NEW IN 2.1)

The 'brake-aware' trim system makes it easy to adjust the pitch trim when brakes are deployed.

1. First, adjust the trim in **Cruise** mode.
2. Next, apply varying amounts of brake, and adjust the elevator trim as necessary. (Behind the scenes, the elevator trim is adjusting the brake compensation curve 'BrakeComp' - see section 5.7)

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 THE LOW BATTERY ALARM

The low battery alert is disabled by default. When enabled, it sounds a "receiver battery low" alert every 7 seconds, as long as the voltage is below a configurable threshold.

To configure and activate the low battery alarm:

1. Go to the **LOGICAL SWITCHES** menu, open LSW28:RXBAT_LOW.
2. Set the source to 'LiPo' or 'RxBat' as required (you may need to discover sensors)
3. Set *Value(X)* to the threshold pack voltage.
4. Go to the **SPECIAL FUNCTIONS**: Play Track:'dl1rxbatlow'.
5. Set *State* to 'enabled' and set the repeat interval (default 7 seconds).

7.3 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**.

7.4 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	VARS →V_Therm2Enable→ <i>values</i>	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. Go to **SPECIAL FUNCTIONS**:PlayTrack:'dl1th1' and replace with your choice.

7.5 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→ <i>Value1</i>	Any momentary switch	SI↓

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

7.6 CHANGING THE CAL SWITCHES

There are two switches which control calibration:

- the momentary switch for entering CAL mode
- the sub-mode switch between 'normal' and 'aileron neutral' modes.

To change the momentary switch, edit a logical switch as follows:

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

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

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

Function	Menu point	Assign to	Default
CAL Submode switch	LOGICALSWITCHES →SW_CAL_NEUTRAL→ <i>Value1</i>	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:

- Open the **MIXER** menu
- Go to mixer ThrWDeadband
- 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

If you have a receiver with altitude telemetry, or a separate altitude sensor, the system can call out launch height. This is the difference between the height at launch, and the maximum height achieved until 3 seconds after exiting Zoom mode. Configure as follows:

Function	Menu point	Note
Callout enable	SPECIAL FUNCTION → PlayAudio ActiveCondition = ALT_CALL	To activate callout, set <i>State</i> to 'enable'
Callout delay	LOGICAL SWITCHES →EXIT_ZOOM_DELAY→ <i>During</i>	Delay after exiting Zoom, 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 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 setup (make a clone)
- Apply your modifications incrementally, testing and backing up as you go along.

8 DISCLAIMER

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