Ahi template
for Taranis and Horus

Version 1.0

Setup Guide

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15 Oct 2018

Contents

1   Introduction

This template is for 4-channel aerobatic slope soarers, for example the Ahi, Phase 6, Voltij etc. It offers quick setup, simple operation, and in-flight adjustments of key mixes. An integrated CAL mode ensures perfect tracking of control surfaces.

Application
- For 4-channel slope soarers
- Cross or T-tail
- Any stick mode

Flight modes
- AERO-HI, AERO-LO, CLIMB and SPEED
- Voice confirmation

In-flight adjustments
- for snapflap volume,
- for aileron diff
- for camber
- for reflex

Control surface calibration
- 'CAL' mode for adjusting servo centres and limits

> Before starting,
> - Please **read through this document once**
> - visit the [support page](#) to see if there are any issues affecting this setup.

1.1   Requirements

- Taranis X9D/X9D+/X9E/Q X7 or Horus X10/X10S/X12S
- OpenTx 2.2.1 or greater (*Note:* 2.2.0 is not supported).
- OpenTx Companion
- USB cable for transmitter <-> PC

1.2   Package contents

Filename	Description
Ahi_10_userguide.pdf	This document
Ahi_10_reference.xls	Settings reference
Ahi_10n.otx	Model file for Companion
*.wav	Sound files

1.3   Stick assignments

Sticks are assigned according to MODEL SETUP → STICK MODE. All available stick modes are supported.

1.4   Channel assignments

Channel #	Function
1	Right aileron
2	Left aileron
3	Elevator
4	Rudder
7-9	[free]

1.5   Flight modes

There are four flight modes selected by switches SA and SB (these can be altered)
SA selects between CLIMB, SPEED and AERO
SB selects AERO-LO or AERO-HI.

Flight Mode	SA	SB	Description
SPEED	↑	[any]	Reflex camber to increase speed
CLIMB	↓	[any]	+ve camber to aid thermalling
AERO-HI	Mid	↑ or —	With snapflap and high rates
AERO-LO	Mid	↓	With snapflap and low rates

1.6   Mixers

Table below shows flight mode/mixer matrix, with adjusters for each mix (or *preset*):

	Snapflap	Camber	Reflex	Ail to Rudder	Diff
Climb		Thr Trim		*preset*	Rudder trim
Aero-Hi	Thr Trim			*preset*	Rudder trim
Aero-Lo	Thr Trim			*preset*	Rudder trim
Speed			Thr Trim	*preset*	Rudder trim

1.7   Trim controls

- Aileron trim is shared across all flight modes.
- Elevator trim is stored per flight mode.
- The rudder trim lever is repurposed for diff adjustment.

1.8   Calibration mode

A special CAL mode is provided for calibrating the servos. When active, all mixing and trims are disabled.
To activate CAL mode:
1. Apply full left aileron and full up elevator
2. Press and release SH
3. Release stick(s). The transmitter cheeps at 3 second intervals

To exit CAL mode, pull SH.
Note: In CAL mode, the ailerons travel together, and the elevator is reversed.

2   Installing the template

Please follow the sequence as shown, use the tick boxes to record your progress.

☐ Establish communication with your PC:
   - ☐ Taranis: press inwards on horizontal trims and switch on. Connect Taranis to computer via USB cable.
   - ☐ Horus: switch on transmitter then connect to the computer via USB cable.

☐ Copy sound (.wav) files to the **\SOUNDS\{language}** folder on the SD card. For example, for English, copy to folder "**\SOUNDS\en"** (this folder should already exist on the SD card).

☐ Using OpenTx Companion, transfer the template to your transmitter as follows:
  ☐ Open the.otx file provided.
  ☐ From the File menu, choose 'Read Models and Settings from Radio'. Your existing models appear in a second window.
  ☐ Drag the Ahi model into an empty slot in the model list.
  ☐ Close the Ahi window.
  ☐ Right-click the new model and choose "Use as Default"
  ☐ Write the modified list to the tx ('Write Models and Settings to Radio').
  ☐ Close OpenTx Companion

☐ **IMPORTANT:** before going further **make sure your sticks are calibrated.** This can be done from the SYSTEM menu. Remember to calibrate the knobs and sliders. Failure to calibrate is one of the main causes of problems, for example jumping neutrals and inability to activate certain flight modes.

☐ Using the transmitter on its own, familiarise yourself with the flight modes. At the end of this step, you should know how to activate:
  ☐ CLIMB, AERO-HI, AERO-LO and SPEED modes
  ☐ CAL mode

☐ Check that the flight mode sounds are working correctly. If not, check (a) sound files copied to correct folder (see above), and (b) check the WAV volume in the RADIO SETUP menu.

3　Setting servo direction

In this section, you set the direction of each servo (don't worry about control surface travel, you'll set those in a later step).

☐ Switch on the transmitter and receiver.

☐ Move the sticks and check the direction of control surfaces

☐ To reverse a channel:
  1. Open the OUTPUTS menu
  2. Go to the *Direction* column
  3. Press **[Enter]**, and immediate **[Exit]**. The arrow has changed direction.

4　Calibrating servo centres and limits

In this section you'll adjust the servo centres and limits. Accurate calibration, with equal up/down movement of the ailerons, is essential for diff to work correctly.

- All adjustments must be made in CAL mode. In CAL mode:
  o All mixers and trims are disabled
  o the ailerons travel together
  o the elevator is reversed
- When setting limits, adjust for **maximum possible deflection** subject to left/right and up/down symmetry.
- Centres and limits are adjusted using curves - **do not alter Min, Max or Subtrim**.

Note for QX 7 users: curves cannot be accessed directly from the Outputs menu - use the CURVES menu.

Channel	Calibration procedure

CH 1:RtAil
CH 2:LtAil
	Calibrate ailerons:
	☐ Enter CAL mode. In CAL mode, ailerons travel together.
	☐ In the OUTPUT menu, highlight **CH1:RtAil**
	☐ Skip to curve field **RtA**, then press **[long ENTER]** to open curve editor
	    o Aileron stick to centre. Set Point 2 for correct centre
	    o Move aileron stick right (→). Set point 3 to desired upper limit.
	    o Move aileron stick left (←). Adjust point 1 so that down-travel = up-travel.
	☐ Repeat for **CH2:LtAil**
	☐ Check: constant rate up/down for each aileron, and check left and right ailerons match. Readjust if necessary.

CH 3:Ele	Calibrate elevator
	☐ Enter CAL mode. In CAL mode, elevator is reversed.
	☐ In the OUTPUT menu, highlight **CH3:Elev**
	☐ Skip to curve field **Ele**, press **[long ENTER]** to open curve editor
	    o Ele stick to centre, adjust point 2 for correct neutral
	    o Ele stick forward (↑), adjust point 3 to upper limit
	    o Ele stick back (↓), adjust point 1 for to lower limit
	☐ Check travel is equal up & down

CH 4:Rudder	Calibrate rudder
	☐ Check you're still in CAL mode
	☐ In the OUTPUT menu, highlight **CH4:Rudd**
	☐ Skip to curve field **Rud**, press **[long ENTER]** to open curve editor
	    o Rudder stick to centre, adjust point 2
	    o Rudder right (→), adjust point 3
	    o Rudder left (←), adjust point 1
	☐ Check equal travel left/right

Well done, calibration is complete!!

☐ Exit CAL mode

☐ Check that surfaces respond to commands. Don't worry that the movements are excessive, they'll be reduced in the next section.

☐ Make a backup copy of your template now.

> **TIP: perform a CAL check**
>
> - **at the start of a flying session**
> - **after a hard landing**
> - **after swapping out a faulty servo for a new one**
> - **whenever you suspect drifting neutrals**

5 Adjusting control travel and mixing

This is where your model comes to life!

Control / mix	Menu point	Description
☐ **Ail rate/expo**	INPUTS→IAil	In this section, you'll set high and low rates. First, set the low rate. This applies to all flight modes except AERO-HI 1. Activate AERO-LO flight mode 2. Open the INPUTS menu 3. Scroll to the In IAil section (3rd group) 4. Highlight 'CATCHALL' line 5. Press **[long ENTER]** and open inputs editor. 6. Adjust *weight* for required upward travel. *Note:* ignore down-travel, it will be adjusted via diff setting. 7. To set *expo*, click on Curve field, choose 'expo', and set value. *Note:* do not try to set aileron diff here (it will affect stick diff, not servo diff). 8. Exit the input editor 9. Finally, set the high rate for AERO-HI flight mode: repeat steps 1-8, except activate **AERO-HI** flight mode and edit the '**Hi Rate**' input line.
☐ **Rud travel/expo**	INPUTS→IRud	*As above*
☐ **Ele travel/expo**	INPUTS→IEle	*As above*
☐ **Camber preset**	GVARS→Cmb	Camber is available in CLIMB mode and is adjustable in flight via the throttle trim. In this step, you (a) will set the limit of adjustment and (b) the operating setting. 1. Activate CLIMB mode 2. Move throttle trim fully back (max camber) 3. Open the GVARS menu 4. Go to GV2:Cmb, skip to column FM2:Climb 5. Adjust GVAR until you reach the desired limit of camber adjustment. 6. Finally, adjust throttle trim for desired initial camber setting
☐ **Reflex**	GVARS→ Cmb	Reflex is available in SPEED mode and is adjustable in flight via the throttle trim. In this step, you (a) will set the limit of adjustment and (b) the operating setting. 1. Activate SPEED mode 2. Move throttle trim fully forward (max reflex) 3. Open the GVARS menu 4. Go to GV2:Cmb, skip to column FM3:Speed 5. Adjust GVAR for desired max reflex. 6. Finally, adjust throttle trim for desired initial reflex setting
☐ **Snapflap**	GVARS→Cmb	Snapflap (elevator to flap mixing) is active in AERO-HI and AERO-LO modes. The amount can be adjusted independently using the throttle trim. In this step, you'll set the limit of adjustment. Then you'll set the operating snapflap for each flight mode. 1. Activate AERO-HI mode 2. Move throttle trim fully back (max snapflap) 3. Open GVARS menu, select row GV2:Cmb, skip to column FM0 4. Hold full up elevator (full back on the stick) 5. Adjust GVAR to desired limit of snapflap adjustment. *Note:* This setting is automatically shared to AERO-LO mode. 6. Adjust the throttle trim for the desired initial setting. 7. Activate AERO-LO mode, and adjust throttle trim for desired initial snapflap setting.
☐ **Ail to rudder**	GVARS→A2R	Aileron to rudder mix is set per flight mode. 1. Open GVARS menu, select row A2R 2. Activate the flight mode to be adjusted. The column is highlighted. 3. Skip to highlighted column. 4. Adjust GVAR for required aileron to rudder mix.

☐ Congratulations, you've finished setting up your model! Back up your template again.

6   Optional customisations

The next section describes optional customisations. Mixer settings etc. will not be affected by these changes. **Remember to backup your setup before making changes.**

6.1   Specifying control rates

The INPUTS menu is where you specify control rates. You can assign specific rates for individual flight modes. In the example below, Climb mode (FM2) has been assigned a 'Very Low' aileron rate of 20%.

Safety note: the last input line in a group should act as the default, with all flight modes checked (the 'CATCHALL' lines in the example above).

6.2   Reassigning flight mode switches

The flight mode switches are defined in the FLIGHT MODES menu. See screen shot below for adjustment points. For CLIMB and SPEED, the same 3-position switch must be specified in the FM2 and FM3 lines; the third unassigned position will select AERO-LO or AERO-HI depending on the switch in the FM4 line.


6.3   Reassigning the CAL switch

For safety, CAL should be activated using a *momentary* switch. The template assumes SH, this being the default momentary on most transmitters. If your momentary switch has a different ID, or you wish to use a different switch (as long it's momentary!), then logical switches L02 and L04 must be modified:

6.4   Altering the snapflap curve

The snapflap response is defined by curve CV5:Snp. By default, the curve applies some deadband to reduce unwanted flap action when making minor pitch corrections. To alter the deadband, go to the CURVES menu, scroll to CV5:Snp, and edit p2->x and p3->x. Do not alter p1 or p4.
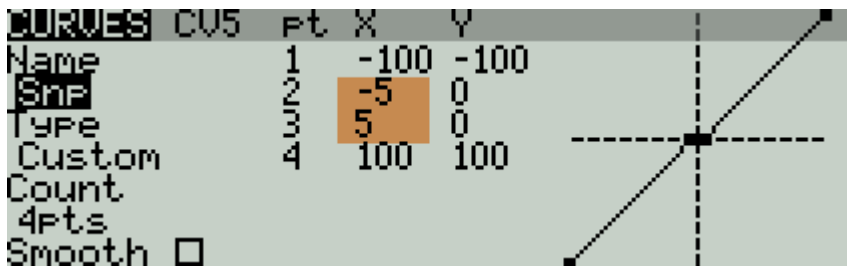
You can also add extra points between p1 and p4, for example to set a non-linear response, and/or to limit the snapflap at a certain point in the elevator travel.

7   Miscellaneous

7.1   Field notes

The table below shows the adjustments you can make on the field. Take a copy to the slope!

Adjustment	Adjuster	Flight modes	Notes
Aileron Diff	Rudder trim	*[all]*	Trim right = more roll response/less diff. Trim left = less roll/more diff. Range of adjustment = 0 - 50%, trim centre = 25%. Stored independently for each flight mode.
Snapflap volume	Throttle trim	AERO-HI, AERO-LO	Trim fully forward = zero snapflap, trim back to increase Stored independently for each flight mode
Camber	Throttle trim	CLIMB	Trim fully forward = zero camber, trim back to increase
Reflex	Throttle trim	SPEED	Trim fully back = zero reflex, trim forward to increase

7.2   Fail safe and battery alarm

Before flying with this setup for the first time, remember to:
- Set the failsafe
- Set the tx battery alarm threshold to suit your battery chemistry.

7.3   Making your own modifications

Before making your own modifications, please study the Excel documentation carefully and make sure you understand the implications of any changes. The recommended workflow is:
1   Setup your model first, as described in this guide
2   Backup your work
3   Apply your modifications incrementally, testing and backing up as you go along.

7.4   Identifying errors

Companion offers a useful 'Compare files' tool for tracking down errors. If you suspect an error:
1   Start Companion
2   Open the original unedited file
3   Open your working EEPROM
4   Click on FILE->COMPARE FILES to open the Compare window, then drag the corresponding models into it.

Any errors should be easy to spot. It's not a bad idea to do a quick check before your first flight.

7.5   Safety/disclaimer

Pretty obvious really, but worth repeating: **it's up to the user to make sure that the controls respond correctly under all conditions**. The author will not be responsible for the consequence of any bugs in the setup or documentation.

> *Test your setup thoroughly*
> ## *If in doubt, DO NOT FLY!!*

7.6   Contact

Feedback and suggestions are always appreciated. Please contact me via http://rc-soar.com/email.htm

Happy aerobating!
Mike Shellim