

Trainer-Students Advanced Settings for OpenTx

There are a few different ways of doing settings for Trainer-Student radio. What I'm writing here is not about "Is it better to share access or to completely swap between trainer and student". This is something I haven't agreed on with myself yet.

At our club we are intending to do much more student training so I was looking for a way to use multiple planes, different student radios and also sharing models on different Frsky radios. So the idea is to do a copy of a model and have all the settings for student radios inside the model settings (not using the calibration/ratio of the basic trainer radio functionality). It should also be very easy for complex models.

This should enable us to do a very fast switch from one combination to another.

Following is a description of how this can be achieved (six examples). Why this may look a little be complex at the first glimpse it is in fact rather easy because 90% is all the same for every configuration. So the actual variation is mainly done in four mixers. The rest can be done by copy and paste in companion or (for experts: doing some Lua scripts). And we are not touching the normal mixer lines of the model so the risk of messing something up is reduced.

Example A

Trainer and student do share control when a hardware switch is set on. Because the students sticks get only 40% or 50% weight he can be overruled by the stick movements of the trainer who has 100%. (Don't give too much weight to the student because it would reduce the trainer influence to a minimum if the student does give full stick).

Step A.1

On my Taranis x8lite S I select the trainer page of the basic radio configuration. It's important that there is no student radio connected. You set Ratio to 1.0 and calibrate. So everything should show zero. (Mode, weight and source on this page you do not care because they are not used in our settings.)

So we end up with values of TR... that are exactly how they transmitted from the student radio. We do not adapt this to the different student radios anymore in the basic settings of the radio.

	Mode	Weight	Source
Rud	:= (Replace)	100	CH3
Ele	:= (Replace)	100	CH2
Thr	:= (Replace)	100	CH4
Ail	:= (Replace)	100	CH1
Multiplier: 1,0			
Calibration	0	0	0

Step A.2

You are defining four mixers (channel 25, 26, 27, 28). Sources are TR1, TR2, TR3, TR4. By choosing the order you are doing the channel mapping. By defining a weight we achieve a range of 200% (-100% to +100%). Last step is to define an offset so that the center-position of the trainer sticks shows 0%. You can easily monitor the values by watching channel or mixer monitor.

The results are four channels calibrated to this specific student radio. (In this screenshot it is a very old Multiplex Pico. So the channel Tr4 is throttle, mapped to channel 27 in my Taranis. Also there is a very wide spectrum of weight I have to use. Shouldn't be like that for a modern quality radio.)

I use AETR so (Ch25=aileron, Ch26=elevator, Ch27=throttle, Ch28=rudder).

Safety issue: Do carefully check that the channel for throttle really achieves -100% at the minimum position!!!

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special F
CH25			TR1	Weight(+125%) NoTrim Offset(-8%) [Tr-ail]				
CH26			TR2	Weight(+140%) NoTrim Offset(7%) [Tr-ele]				
CH27			TR4	Weight(+126%) NoTrim Offset(-9%) [Tr-thr]				
CH28			TR3	Weight(+117%) NoTrim Offset(3%) [Tr-rud]				

Step A.3

We need two logical switches. We do use a 3-position hardware switch for switching (e.g.: SA)

L15 on: means student has control and SA- is switched on

L16 on: means student has control and SAV is switched on

L15	OR	SA-	SA-	----	0,0	0,0
L16	OR	SA↓	SA↓	----	0,0	0,0

Step A.4

We are mixing the Trainer sticks (**not** inputs) with the student sticks. Mixer numbers are 29 to 32.

L15 = student on 40% weight; L16 = student on 50% weight

Trainer has always 100% weight.

Only trainer has access to throttle (mixing does not make sense).

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions
CH29				Ail Weight(+100%) NoTrim [M-Ail]				
				+= CH25 Weight(+40%) Switch(L15) NoTrim [T-Ail1]				
				+= CH25 Weight(+50%) Switch(L16) NoTrim [T-Ail2]				
CH30				Ele Weight(+100%) NoTrim [M-Ele]				
				+= CH26 Weight(+40%) Switch(L15) NoTrim [T-Ele1]				
				+= CH26 Weight(+50%) Switch(L16) NoTrim [T-Ele2]				
CH31				Thr Weight(+100%) NoTrim [M-Thr]				
CH32				Rud Weight(+100%) NoTrim [M-Rud]				
				+= CH28 Weight(+40%) Switch(L15) NoTrim [T-Rud1]				
				+= CH28 Weight(+50%) Switch(L16) NoTrim [T-Rud1]				

Step A.5

We change the sources of our inputs. I use AETR so it's (Ail to Ch29), (Ele to Ch30)

Be aware that by this you lose the Trims in the input line (from ON to OFF). So you have to edit the inputs and select the proper trim-source manually. (Example for Ail select TrmA)

(The weight and Expo you use in inputs are affecting both trainer and student accordingly. They are not part of trainer-student settings)

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches
I1:Ail			CH29 Weight(+100%) Expo(50%) TrmA				
I2:Ele			CH30 Weight(+100%) Expo(50%) TrmE				
I3:Thr			CH31 Weight(+100%) TrmT				
I4:Rud			CH32 Weight(+100%) Expo(50%) TrmR				

That's it.

We do not have to modify anything of the other existing settings like mixers for servos.

Example B

Only one person is controlling the plane at a time (either trainer or student). To switch the plane to student the trainer has to set a hardware switch in the required position and also move the sticks (aileron, elevator, rudder) in neutral position. In example B throttle is always reserved for trainer. As soon as the trainer moves a stick (aileron, elevator, rudder) he has control again (100%). Control goes back to student when the sticks (aileron, elevator, rudder) are in neutral position again. There's no manually operating a switch. But it's best to set student completely off by hardware switch when starting or landing.

Step B.1

Identical to Step A.1

Step B.2

Identical to Step A.2

Step B.3

We do need a few logical switches. The results of these are:

L14 on: means Student has access

L15 on: means student has access and SA- is switched on (60% weight for student)

L16 on: means student has access and SAV is switched on (80% weight for student)

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions	Telemetry	Custom Screens
L11	a <x		Ail	2		ISA↑	0,0	0,0		
L12	a <x		Ele	2		L11	0,0	0,0		
L13	---									
L14	a <x		Rud	2		L12	0,0	0,0		
L15	AND		L14	SA-		----	0,0	0,0		
L16	AND		L14	SA↓		----	0,0	0,0		

Step B.4

This is very similar to Step A.4

We are mixing the Trainer sticks (**not** inputs) with the student sticks. Mixer numbers are 29 to 32. But we use logical switches and we use replace instead of add. We also can give the student more weight. (You should not do that in example A because it would reduce the trainer influence to a minimum if the student does give full stick).

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Fu
CH29	Ail Weight(+100%) NoTrim [M-Ail]							
	:= CH25 Weight(+60%) Switch(L15) NoTrim [T-Ail1]							
	:= CH25 Weight(+80%) Switch(L16) NoTrim [T-Ail2]							
CH30	Ele Weight(+100%) NoTrim [M-Ele]							
	:= CH26 Weight(+60%) Switch(L15) NoTrim [T-Ele1]							
	:= CH26 Weight(+80%) Switch(L16) NoTrim [T-Ele2]							
CH31	Thr Weight(+100%) NoTrim [M-Thr]							
CH32	Rud Weight(+100%) NoTrim [M-Rud]							
	:= CH28 Weight(+60%) Switch(L15) NoTrim [T-Rud1]							
	:= CH28 Weight(+80%) Switch(L16) NoTrim [T-Rud1]							

Step B.5

Identical to Step A.5

Example C

It's similar to Example B. But we also allow access to throttle for student.

Step C.1

Identical to Step A. 1 and B.1

Step C.2

Identical to Step A.2 and B.2

Step C.3

We do need a few logical switches again. (This time we also have to check trainer throttle stick. Throttle has to be nearly -100% to give access to the student.)

The results of the switches are similar:

L14 on: means Student has access

L15 on: means student has access and SA- is switched on (60% weight for student)

L16 on: means student has access and SAV is switched on (80% weight for student)

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions	Telemetry	Custom Screens
L11	a <x	Ail	2	ISA↑	0,0	0,0				
L12	a <x	Ele	2	L11	0,0	0,0				
L13	a<x	Thr	-98	L12	0,0	0,0				
L14	a <x	Rud	2	L13	0,0	0,0				
L15	AND	L14	SA-	----	0,0	0,0				
L16	AND	L14	SA↓	----	0,0	0,0				

Step C.4

This is similar to Step B.4

But this time we do also put mixer line in (CH31) that gives the student access to throttle.

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions
CH29				Ail Weight(+100%) NoTrim [M-Ail] := CH25 Weight(+60%) Switch(L15) NoTrim [T-Ail1] := CH25 Weight(+80%) Switch(L16) NoTrim [T-Ail2]				
CH30				Ele Weight(+100%) NoTrim [M-Ele] := CH26 Weight(+60%) Switch(L15) NoTrim [T-Ele1] := CH26 Weight(+80%) Switch(L16) NoTrim [T-Ele2]				
CH31				Thr Weight(+100%) NoTrim [M-Thr] := CH27 Weight(+100%) Switch(L14) NoTrim [T-Thr]				
CH32				Rud Weight(+100%) NoTrim [M-Rud] := CH28 Weight(+60%) Switch(L15) NoTrim [T-Rud1] := CH28 Weight(+80%) Switch(L16) NoTrim [T-Rud1]				

Step C.5

Identical to Step A.5 and B.5

Example D

It's similar to Example B - No throttle for student.

We take away control from the student on single functions aileron/elevator/rudder when trainer stick is moved (not all three functions at once).

Step D.1

Identical to Step A. 1

Step D.2

Identical to Step A. 2

Step D.3

Again we need a few logical switches.

The meaning of the switches is: (e.g.: for aileron)

L11 on: student has control and SA- is on (60% weight for student)

L12 off: student has control and SAV is on (80% weight for student)

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions	Telemetry	Custom Screens
L11	a <x	Ail	2	SA-	0,0	0,0				
L12	a <x	Ail	2	SA↓	0,0	0,0				
L13	a <x	Ele	2	SA-	0,0	0,0				
L14	a <x	Ele	2	SA↓	0,0	0,0				
L15	---									
L16	a <x	Rud	2	SA-	0,0	0,0				
L17	a <x	Rud	2	SA↓	0,0	0,0				

Step D.4

This is similar to Step B.4

For the student we need two mixer lines for every function (one for 60% and one for 80% weight). Every line does require its own logical switch.

up	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special F
CH29	Ail	Weight(+100%)	NoTrim	[M-Ail]				
	:= CH25	Weight(+60%)	Switch(L11)	NoTrim	[T-Ail1]			
	:= CH25	Weight(+80%)	Switch(L12)	NoTrim	[T-Ail2]			
CH30	Ele	Weight(+100%)	NoTrim	[M-Ele]				
	:= CH26	Weight(+60%)	Switch(L13)	NoTrim	[T-Ele1]			
	:= CH26	Weight(+80%)	Switch(L14)	NoTrim	[T-Ele2]			
CH31	Thr	Weight(+100%)	NoTrim	[M-Thr]				
CH32	Rud	Weight(+100%)	NoTrim	[M-Rud]				
	:= CH28	Weight(+60%)	Switch(L16)	NoTrim	[T-Rud1]			
	:= CH28	Weight(+80%)	Switch(L17)	NoTrim	[T-Rud1]			

Step D.5

Identical to Step A.5

Example E

It's similar to Example D. But we also allow access to throttle for student.

We only take away control from the student on single functions aileron/elevator/throttle/rudder when trainer stick is moved (not all functions at once).

Step E.1

Identical to Step A. 1

Step E.2

Identical to Step A.2

Step E.3

Again we need a few logical switches.

The meaning of the switches is: (e.g.: for aileron)

L11 on: student has control and SA- is on (60% weight for student)

L12 off: student has control and SAV is on (80% weight for student)

L15 on: student has control to throttle

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions	Telemetry	Custom Screens
L11	a <x		Ail		2		SA-	0,0		0,0
L12	a <x		Ail		2		SA↓	0,0		0,0
L13	a <x		Ele		2		SA-	0,0		0,0
L14	a <x		Ele		2		SA↓	0,0		0,0
L15	a<x		Thr		-98		ISA↑	0,0		0,0
L16	a <x		Rud		2		SA-	0,0		0,0
L17	a <x		Rud		2		SA↓	0,0		0,0

Step E.4

Nearly identical to Step D.4

For the student we need two mixer lines for every function (one for 60% and one for 80% weight).

Every line does require its own logical switch.

Throttle (CH31) needs an additional mixer line for student.

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special F
CH29			Ail	Weight(+100%) NoTrim [M-Ail]				
				:= CH25 Weight(+80%) Switch(L11) NoTrim [T-Ail1]				
				:= CH25 Weight(+100%) Switch(L12) NoTrim [T-Ail2]				
CH30			Ele	Weight(+100%) NoTrim [M-Ele]				
				:= CH26 Weight(+50%) Switch(L13) NoTrim [T-Ele1]				
				:= CH26 Weight(+70%) Switch(L14) NoTrim [T-Ele2]				
CH31			Thr	Weight(+100%) NoTrim [M-Thr]				
				:= CH27 Weight(+100%) Switch(L15) NoTrim [T-Thr]				
CH32			Rud	Weight(+100%) NoTrim [M-Rud]				
				:= CH28 Weight(+60%) Switch(L16) NoTrim [T-Rud1]				
				:= CH28 Weight(+80%) Switch(L17) NoTrim [T-Rud1]				

Step E.5

Identical to Step A.5

Example F (my favorite)

After some testing this is my personal favorite.

The example is a mixture of Example B and E.

The control of rudders (A/E/R) and gas are handled separate.

To switch the plane to student the trainer has to set a hardware switch in the required position and also move the sticks (aileron, elevator, rudder) in neutral position. As soon as the trainer moves a stick (aileron, elevator, rudder) he has control again (100%). Control goes back to student when the sticks (aileron, elevator, rudder) are in neutral position again.

The same is done with gas but independent of A/E/R . Student controls throttle only if the throttle stick of the trainer is at -100%.

It's best to set student completely off by hardware switch when starting or landing.

Warning: When trainer sticks are in idle position but student sticks are not then engine is running. So if you want to take control over throttle as trainer while flying you have to move the throttle stick a little away from the idle position.

Step F.1

Identical to Step A. 1

Step F.2

Identical to Step A. 2

Step F.3

We do need a few logical switches. The results of these are:

L13 on: means student has access to throttle

L14 on: means Student has access to aileron/elevator/rudder

L15 on: means student has access to A/E/R and SA- is switched on (60% weight for student)

L16 on: means student has access to A/E/R and SAV is switched on (80% weight for student)

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions	Telemetry	Custom Screens
L11	a <x		Ail		4		ISA↑	0,0		0,0
L12	a <x		Ele		2		L11	0,0		0,0
L13	a<x		Thr		-98		ISA↑	0,0		0,0
L14	a <x		Rud		2		L12	0,0		0,0
L15	AND		L14		SA-		----	0,0		0,0
L16	AND		L14		SA↓		----	0,0		0,0

Step F.4

Nearly identical to Step C.4

For the student we need two mixer lines for every function (one for 60% and one for 80% weight).

Throttle (CH31) needs an additional mixer line for student, switched by L13.

Setup	Heli	Flight Modes	Inputs	Mixes	Outputs	Curves	Logical Switches	Special Functions
CH29	Ail Weight(+100%) NoTrim [M-Ail] := CH25 Weight(+80%) Switch(L15) NoTrim [T-Ail1] := CH25 Weight(+100%) Switch(L16) NoTrim [T-Ail2]							
CH30	Ele Weight(+100%) NoTrim [M-Ele] := CH26 Weight(+50%) Switch(L15) NoTrim [T-Ele1] := CH26 Weight(+70%) Switch(L16) NoTrim [T-Ele2]							
CH31	Thr Weight(+100%) NoTrim [M-Thr] := CH27 Weight(+100%) Switch(L13) NoTrim [T-Thr]							
CH32	Rud Weight(+100%) NoTrim [M-Rud] := CH28 Weight(+60%) Switch(L15) NoTrim [T-Rud1] := CH28 Weight(+80%) Switch(L16) NoTrim [T-Rud1]							

Step F.5

Identical Step A.5

Conclusions

I could have simplified Example B, C, D, E by using multiple input lines instead of mixers (no Ch29 to Ch32). But it seemed to be a good idea trying to move through all different levels during training.

Novice student could start with Example A - next step Example B while enabling much more weight - and finally Example C getting access to throttle. The fact that the definition in the radio is very similar enables to modify it rather easily from one level to the next.

If you have:

To use same model but new student radio:

- Make a copy of the model
- Adapt mixer channel 25 to 28 to new student radio

Prepare new model:

- Copy logical switches (11 to 16) (only example B and C)
- Copy mixer channel 25 to 32
- Adapt mixer channel 25 to 28 (only if other student radio)
- Modify inputs

ChrisOHara 7-May-2023