

Drone

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2 Version history

Date	Who	Status	Comment
09-06-2020	JVD	Initial version	Initial Version

3 Summary

Once upon a time... I decided to create a drone. This document is my as build document. I has assembled links to video's about drone building, info about the used components, methods to update.

My native language is Dutch, so some parts are in Dutch.

4 My drone on Rotorbuilds.com

See <https://rotorbuilds.com/build/23657>

5 R-XSR receiver

5.1 Pin lay-out (f-port)

https://www.reddit.com/r/Multicopter/comments/7uz51s/frsky_fport_is_now_available_for_rxsr_receivers/

betaflight tekst uitleg + firmware link: <https://github.com/betaflight/betaflight/wiki/The-FrSky-FPort-Protocol>

uitleg (maar voor 1 antenne model): <https://oscarliang.com/setup-frsky-fport/>

Video Jushua Bartwell (wat? Verschil: fbus, sbus):

<https://www.youtube.com/watch?v=pVIXwk4eRW8>

Nota: op mijn ctrl best Vcc 4.5V nemen ipv 5V-pad: reden nu is receiver door usb gevoed en is geen batt nodig bij inav instellingen.

Commertaar video: FPort to Telemetry/SmartPort.

5.2 Binding met taranis x9d

<https://www.youtube.com/watch?v=UH13IA9Y5uI>

<https://www.youtube.com/watch?v=MyGVPnUYoUI>

5.3 Update R-XSR via smartport op taranis

Tekst: https://www.multirotorparts.nl/downloads/X9D_Transmitter_Smart_Port_upgrade.pdf

voor taranis poort in batt compartiment: zie video

https://www.multirotorparts.nl/downloads/X9D_Transmitter_Smart_Port_upgrade.pdf

5.4 Register R-xsr op internal module Taranis

- Firmware is fport en access: zie en download link (links): <https://www.frsky-rc.com/frsky-advanced-communication-control-elevated-spread-spectrum-access-protocol-release/>
- Doe register procedure

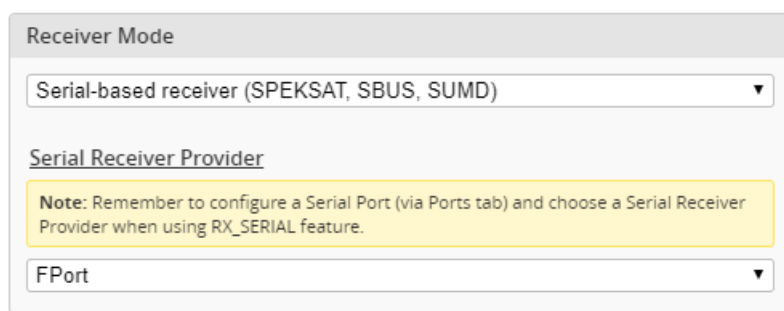
<https://oscarliang.com/bind-frsky-access-receiver/>

- Doe bind procedure (auto bind ging niet eerste keer?)
- Zie ook <https://www.youtube.com/watch?v=UH13IA9Y5ul>
-

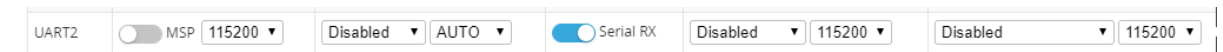
5.5 F-port setup

- Zie <https://oscarliang.com/setup-frsky-fport/>

1) Menu configuration



2) Config uart 2 (menu, ports)



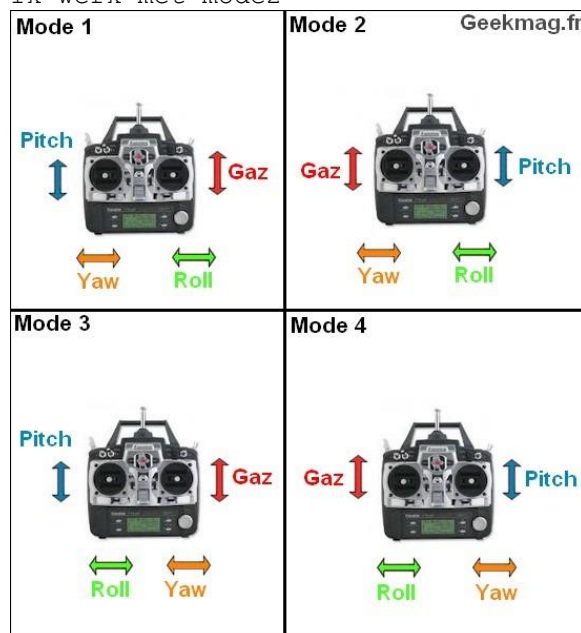
3) Cli commando: (default beide off)

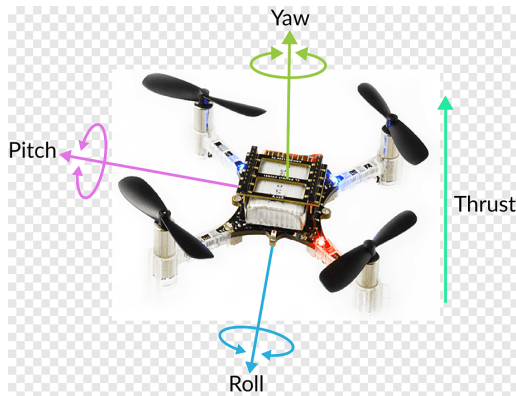
```
set serialrx_halfduplex = ON
set serialrx_inverted = ON
save
```

4) Hoewel receiver nu reageert op input, is stick mixing niet ok: taer nodig

CH1 = Thr (Throttle)
CH2 = Ail (roll)
CH3 = Ele (pitch)
CH4 = Rud (yaw)

Ik werk met mode2





5.6 Adjust stick range

methoden: 1 via Taranis receiver, andere via cli op FC. Ik koos deze laatste

zie ook: <https://oscarliang.com/adjust-tx-channel-mid-end-point/>

5.6.1.1 zet in cli rxrange inav

➔ zie dat waarden gereset zijn zodat je via tx taranis deze kan instellen.

```
rxrange 0 1000 2000
rxrange 1 1000 2000
rxrange 2 1000 2000
rxrange 3 1000 2000
```

5.6.1.2 menu receiver, noteer min/max stick

TAER

In output screen zien we channel 0 tot 3; in inav lezen we switch posities af voor min en max.

ch0 THR => 994 tot 2011

ch3 YAW => 992 tot 2006

ch2 Pitch => 987 tot 2011

Ch1 Roll => 987 tot 2011

5.6.1.3 taranis endpoints

nota: zet extended limits on in model setup zodat je aanpassingen boven 100% kan gaan.

Zet in outputs op teranis:

Ch1= -505.8 tot 500.2 delta blijft 1500

CH2 = -499.7 tot 500.2 delta blijft 1500

CH3 = -499.7 tot 500.7 delta blijft 1500

CH4 = -499.7 tot 500.7 delta blijft 1500

5.6.2 Cli min/max endpoints

Zet in inav cli. (dode hoeken in throttle)

min_check = 1010 ipv 1100

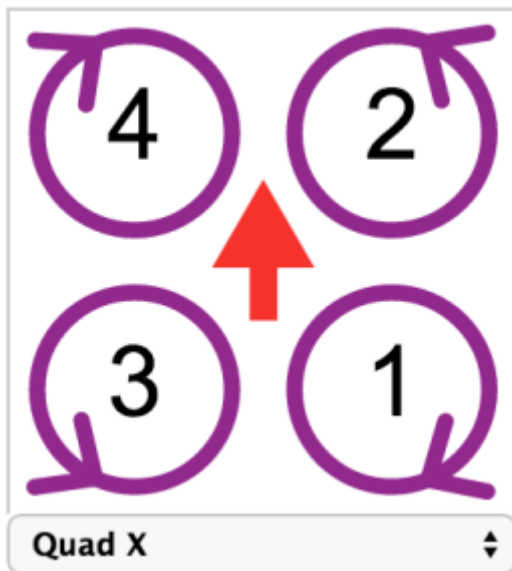
Max_check = 1990 ipv 1900

6 ESC (Racerstar PG50x4 50A 2-6S Blheli_32 Proshot 4 In 1 Brushless ESC SBEC 2A/5V for RC Drone FPV Racing)

6.1 Volgorde motoren (+ software correctie)

Zie <https://fpvfrenzy.com/betaflight-motor-order/>

Draairichting = standaard (zie lager)



When the quadcopter is facing away from you,

- The back right motor is motor #1, and should spin clockwise
- The front right motor is motor #2, and should spin counter-clockwise
- The back left motor is motor #3, and should spin counter-clockwise
- The front left motor is motor #4, and should spin clockwise

Mijn config Racerstar:

Motor signal cables hersolderen: 1 op 3 en 2 op 4.

6.2 BLheli_suite

https://github.com/bitdump/BLHeli/tree/master/BLHeli_32%20ARM verwijst door naar ondermeer:

Download: https://drive.google.com/drive/folders/1Y1bUMnRRoImMD_lezL0FYd3aMBrNzCig

- Update firmware van 32.3 naar 32.7
- **Reverse motor 1 en 4**
- Auto telemetry up. (moet niet)

BLHeliSuite32 32.7.1.1 [m4wFCIntf ARM-BLB @COM3]

ESC setup ESC tools Select BLHeli_32 Interface Options ? BLHeli_32 info Save Screenshot Styles

ESC Setup	ESC overview	ESC Flash	Motors	Make interfaces
	ESC#1	ESC#2	ESC#3	ESC#4
Name				
ESC Layout	Siskin_ST	Siskin_ST	Siskin_ST	Siskin_ST
BLHeli Rev.	32.7	32.7	32.7	32.7
Mode	Multi	Multi	Multi	Multi
Motor Direction	Reversed	Normal	Normal	Reversed
Rampup Power	50 %	50 %	50 %	50 %
PWM Frequency	24 kHz	24 kHz	24 kHz	24 kHz
Motor Timing	16 deg	16 deg	16 deg	16 deg
Demag Compensation	Low	Low	Low	Low
Minimum Throttle	1000	1000	1000	1000
Center Throttle	1500	1500	1500	1500
Maximum Throttle	2000	2000	2000	2000
Throttle Cal Enable	On	On	On	On
Temperature Protection	140 C	140 C	140 C	140 C
Low RPM Power Protect	On	On	On	On
Brake On Stop	Off	Off	Off	Off
Startup Beep Volume	40	40	40	40
Beacon/Signal Volume	80	80	80	80
Beacon Delay	10:00 min	10:00 min	10:00 min	10:00 min
Maximum Acceleration	Maximum	Maximum	Maximum	Maximum
Non Damped Mode	Off	Off	Off	Off
Music Note Config	Music Off	Music Off	Music Off	Music Off
Sine Modulation Mode	Off	Off	Off	Off
Auto Telemetry	On	On	On	On
Stall Protection	Normal	Normal	Normal	Normal
Startup Music Data				

COM3 Baud: 115200 Disconnect Multiple ESC / Master#1 1 2 3 4 Check

ESC#1 setup read successfully

Nota: na wijzigingne main batt disconnect to reboot!

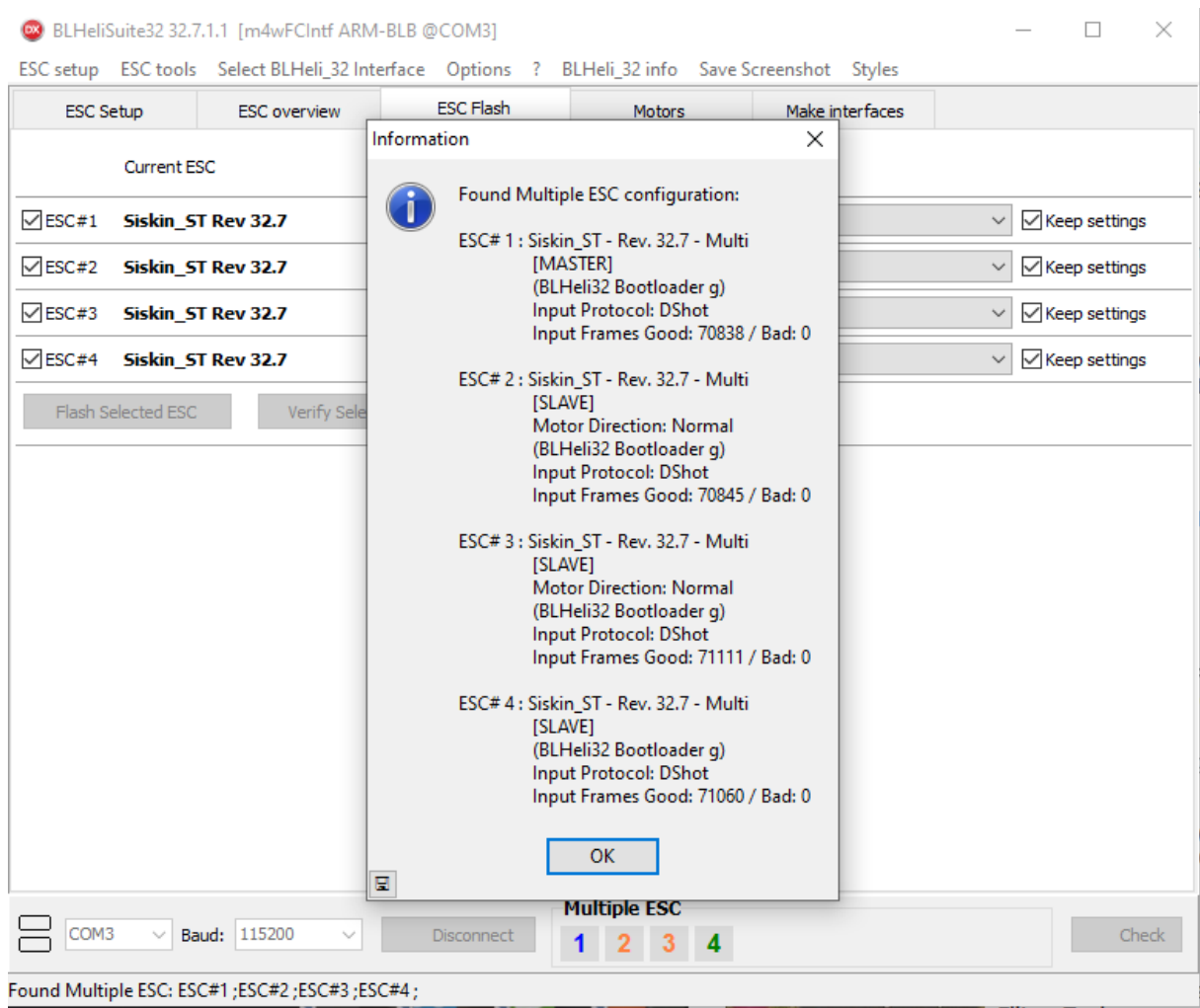
6.3 BHHeli suite: connect

Zie video <https://www.youtube.com/watch?v=yTpTUX2ohoM>

Op 3'52" wordt heel wat gezegd over volgorde van aanzetten power/connect.

- Connect usb aan quad. Niet connecteren.
- Connect batt aan quad
- druk in bheli op "connect" end dan op "check"

Je krijgt dit scherm:



Video overview basis settings uit 2016: zie https://www.youtube.com/watch?v=w-V0BNux-Pw&list=PLiYHnH4BhI87HJXcyYui_Tzoc3bkcFhX&index=6&t=0s

6.4 Muziek Knight Rider

Zie https://www.youtube.com/watch?v=ZLopLEvtA-Q&list=PLwip8UXl_Wqg4FUnzJBpHO_VSBquJgiac&index=32

SET: LENGTH 8 INTERVAL 2 (You may need to adjust these depending on motors and props) Right click each ESC to select them individually. Copy and paste the text for each ESC into the Music Editor and Apply Music.

Click on Write Setup for each ESC KNIGHT RIDER 8/2

ESC#1 TURN VOLUME DOWN BY 10

F#5 4 P4 G5 4 F#5 4 F#5 4 G5 4 F#5 4 F#5 4 G5 4 F#5 4 F#5 4 F5 4 F#5 4 F#5 4 F#5 4 F#5 4 F#5 4 G5 4 F#5 4 F#5 4 G5 4 F#5 4 F#5 4 G5 4 F#5 4 F#5 4 F5 4 F#5 4 F#5 4 F#5 4 E5 4 E5 4 F5 4 E5 4 E5 4 F5 4 E5 4 E5 4 E5 4 F5 4 E5 4 E5 4 E5 4 F5 4 E5 4

ESC#2 TURN VOLUME UP BY 10

F#4 4 F#4 2 P1 P4 F#4 4 F#4 2 P1 P4 F#4 4 F#4 2 P1 P4 F#4 4 F#4 2 P1 P4 E4 4 E4 2 P4 E4 4 E4 2 P4 E4 4 E4 2 P1

ESC#3

F#6 2 G6 4 F#6 4 C#7 1 P1 P1 F#7 2 G7 4 F#7 4 C#7 1 P1 P1 F#6 2 G6 4 F#6 4 C#7 2 F#7 2 E7 1 P2 P4

ESC#4

F#6 2 G6 4 F#6 4 C#7 1 P1 P1 F#7 2 G7 4 F#7 4 C#7 1 P1 P1 F#6 2 G6 4 F#6 4 C#7 2 F#7 2 E7 1 P2 P4

ENJOY! LEAVE SUGGESTIONS IN THE COMMENTS!

6.5 Standaard props vs reverse props

Zie video Jushua Bartwell: <https://www.youtube.com/watch?v=bZL-BBI9JnE>

- ➔ Kleine drones (tot 3'') = reverse props
- ➔ Grotere drones (> 3'') = standaard props (standaard)

Reden: bij draaien is yaw en roll door dezelfde motor verzorgd. Als deze motor "maxout" is, zal dit effect je vertragen. Bij reverse props is deze functie verdeeld over 2 motoren -> meer snelheid mogelijk. Echter bij grotere quads kom je bijna nooit aan maxout voor 1 motor.

Reden: lens mooier bij turtle mode.

7 ESC LED

Zie <https://oscarliang.com/motor-wire-led/>

8 Video transmitter: Vtx Power Tank

8.1 Waarschuwing: power on first time

However, there is some inconsistency in the default VTX configuration. From the units i tested, they mostly come pre-configured to 25mW and set to Raceband CH1, but a few are set to Fatshark CH1. There was one that was even set to 800mW! So make sure you check yours when powering on for the first time, you don't want it to transmit at maximum power on the bench for too long to avoid overheat.

8.2 Review + config in tekst:

Zie <https://oscarliang.com/rush-vtx-tank-plus-race-mini-tiny/>

8.3 VTX Table to enter in CLI (FCC)

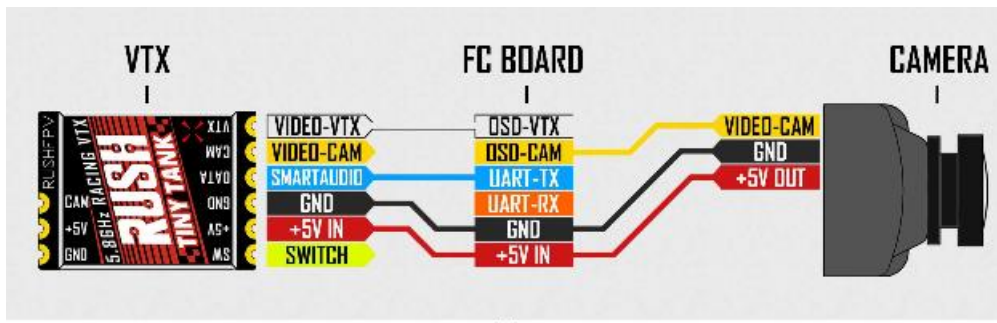
```
vtxtable bands 5
vtxtable channels 8
vtxtable band 1 BOSCAM_A A FACTORY 5865 5845 5825 5805 5785 5765 5745 5725
vtxtable band 2 BOSCAM_B B FACTORY 5733 5752 5771 5790 5809 5828 5847 5866
vtxtable band 3 BOSCAM_E E FACTORY 5705 5685 5665 0 5885 5905 5925 0
vtxtable band 4 FATSHARK F FACTORY 5740 5760 5780 5800 5820 5840 5860 5880
vtxtable band 5 RACEBAND R FACTORY 5658 5695 5732 5769 5806 5843 5880 5917
vtxtable powerlevels 4
vtxtable powervalues 14 23 27 29
vtxtable powerlabels 25 200 500 800
save
```

8.4 Wiring up

Nota: hier neemt men 5v ipv batt input.

<https://upload.latest.facebook.com/TEAM.RUSHFPV/photos/pcb.589575448292791/589575144959488/?type=3&theater>

<https://upload.latest.facebook.com/TEAM.RUSHFPV/posts/589575448292791>



Video BetaFlight lookup table setup manually: https://www.youtube.com/watch?v=kUOf_D3lqQw

Review + pinlayout: zie <https://www.youtube.com/watch?v=AeEdjTWuDeA>

Rond 6' start pinlayout.

8.5 VTx overzicht: ondermeer plaatsing:

- Nooit opstarten zonder antenne omwille van warmte
- Carbon Frame geleid: isoleren!

<https://oscarliang.com/choose-video-transmitter-fpv-mini-quad/>

9 Runcam Camera

Officiële website (niet interessant): <https://shop.runcam.com/runcam-phoenix-2/>

Vbat+:

- Aansluiting vbat+: zie <https://intofpv.com/t-runcam-swift-2-vbat-question?page=2>
- Doel: (om op osd de lipo voltage te zien)
- (→ ik denk enkel nodig als je geen vbat via vtx aansluit)
- ➔ Niet aansluiten.

Kies: Aansluiting RX en TX om via uart settings te doen.

Mounting (deels)

<https://www.youtube.com/watch?v=i6TCCVyQmfg>

9.1 Uart ctrl mode

Default is helaas joystick ctrl.

10 F7 controller - Matec f722-SE

10.1 Matec website

<http://www.matecsys.com/?portfolio=f722-se#tab-id-1>

- ➔ Barometer = Baro: BMP280 (I2C)
- ➔ IMU: MPU6000 (default) & ICM20602 (zeer gevoelig 32kHz), Dual Gyros built-in (SPI)

10.2 Firmware target

Target: MATEKF722SE

10.3 Led status

Zie <https://github.com/iNavFlight/inav/blob/master/docs/Board%20-%20MatekF722-SE.md>

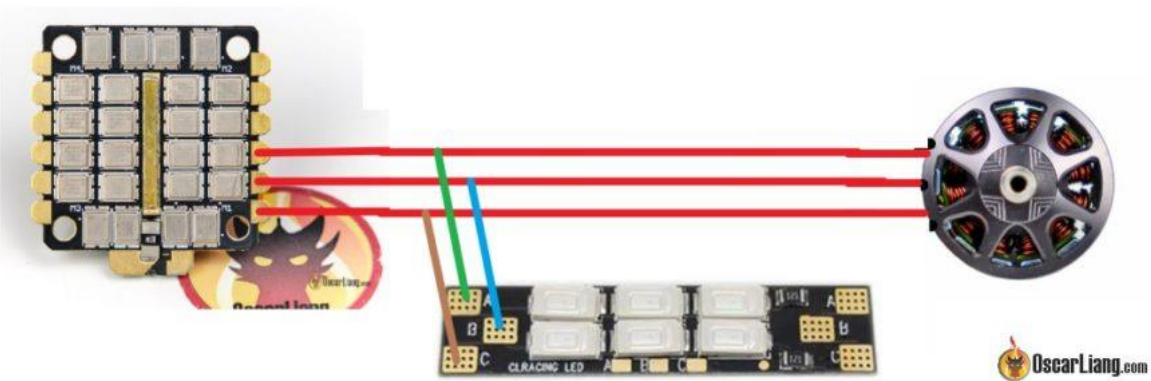
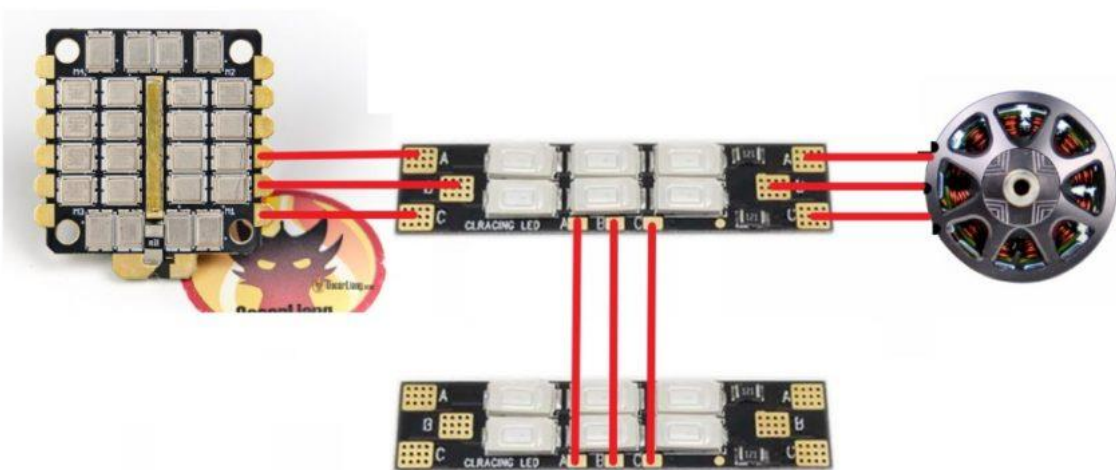
Status LEDs

LED	Color	Color Codes
FC Status	Blue	Unlit: USB disconnected and disarmed, Lit: USB disconnected and armed, Flashing: USB connected and disarmed, 5x Rapid Flash then Flashing: USB connected and arming command prevented
Accelerometer	Green	Accelerometer status (Lit: active, Unlit: inactive)
3v3 Status	Red	Red: active, Unlit: inactive

<http://www.mateksys.com/?p=5159#tab-id-7>

10.4 Bespreking bord aansluitingen

<https://www.youtube.com/watch?v=AgzuKDdIAAI>



11 Smokestopper

Zie video Joshua Bardwell: <https://www.youtube.com/watch?v=I5a0TAmEwLE>



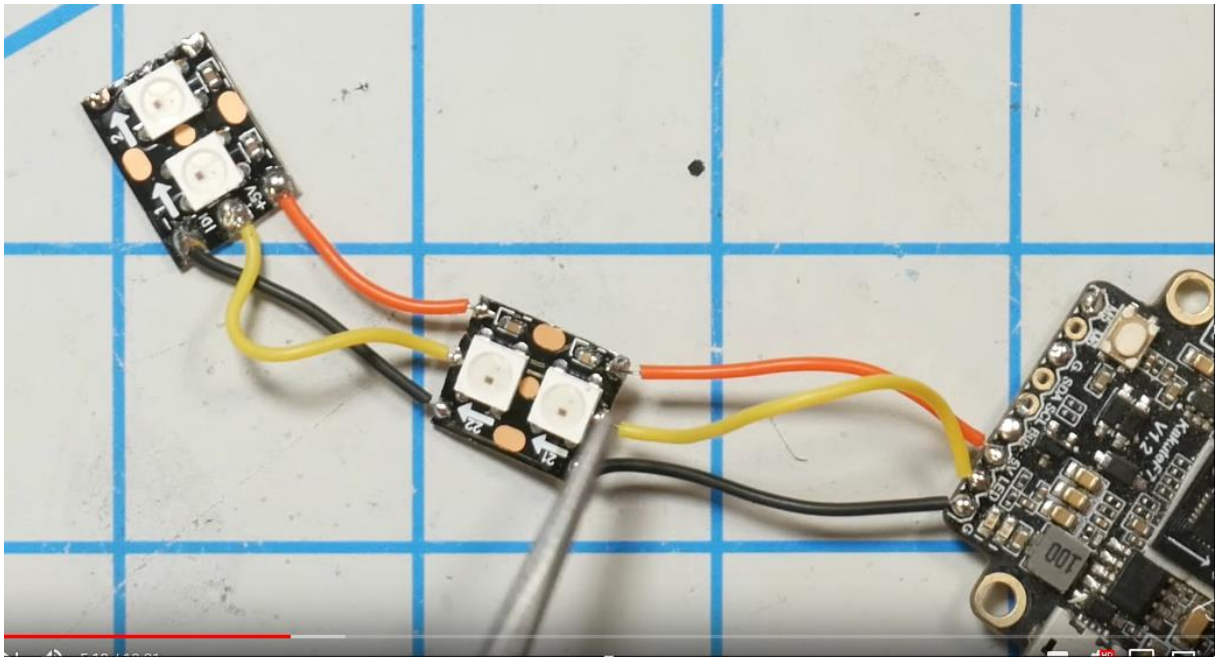
To build a smoke stopper as shown in the video, use a 3157C standard bulb (2-element 27 watts / 8 watts). You can find this at your local automotive supply store, or purchase on Amazon here:

<https://amzn.to/2EswmPb>

- ➔ Volledige omschrijving: 12V 3157 W2.5x16Q P27/7W met “W2.5x16Q” type connector en “P27/7W” wattage van de 2 elementen.
Nagemeten: 2.99 A bij 4S batt.
- ➔ Amazon.fr: https://www.amazon.fr/Aerzetix-Ampoule-12V-3157-W2-5x16Q/dp/B01HRY34R2/ref=sr_1_fkmr0_1?dchild=1&keywords=SYLVANIA+3157+Long+Life+Miniature+Bulb%2C+%28Contains+2+Bulbs%29&linkCode=gs3&linkId=498d1d81a8b2994b215c6c42f593410b&qid=1586760449&sr=8-1-fkmr0

12 Programmable LED's

Zie video Jushua Bardwell: <https://www.youtube.com/watch?v=Em2tH1n5UxA&t=1025s>



Nota: de pijltjes moeten “weg van de Flight Controller wijzen”. Zie tekening.

12.1 Doc en uitleg rond config

Zie tekst en video Oscar Liang: <https://oscarliang.com/setup-led-betaflight/>

Zie wiki Betaflight (inav is er niet):

<https://github.com/betaflight/betaflight/blob/master/docs/LedStrip.md>

12.2 Mijn config

Draft

Power komt van ...



13 AWG – voltage drop

Zie <https://www.calculator.net/voltage-drop-calculator.html?material=copper&wiresize=338.6&voltage=5&phase=dc&noofconductor=1&distance=0.15&distanceunit=meters&eres=.5&x=62&y=19>

- ➔ AWG 30; goed tot 1A max 2A bij 5V
- ➔ AWG 10 kan tot 50A en 12V (15 cm)
- ➔ AWG 14 kan tot 40A en 12, maar voltage drop licht merkbaar. (15 cm)

14 Antenna mounting

Tekst: Zie <https://www.getfpv.com/learn/fpv-essentials/fpv-drone-antenna-mounting-guide/>

Video Joshua Bardwell (durability): <https://www.youtube.com/watch?v=KA2OLTBIjKk>

- ➔ R-XSR: Zip tie + schrink, loodrecht op achterpoten, antenne zelf best langs onderkant. (zie 8' in video)



- VTx: ziptie voor en achter sma connector, achteraan uitsteken. Moet kunnen bewegen (zie ondermeer 3'). Geen vijzen wegens druk@ crash. (druk: zie ondermeer 3'23'')



15 GPS (Betian BN-880)

Inav manual: <https://github.com/iNavFlight/inav/wiki/GPS--and-Compass-setup>

Ublock pdf: https://www.u-blox.com/sites/default/files/products/documents/u-blox7-V14_ReceiverDescriptionProtocolSpec_%28GPS.G7-SW-12001%29_Public.pdf

- Nota: With iNav 1.9 and later, Galileo can be enabled with the CLI setting `set gps_ublox_use_galileo = ON` (the default is off).
- Als gps onder hoek is gemonteerd, bv op camera 30°

*If external Compass module is mounted at 30 degree. For example at top of a Cam mount, free alignment is possible by Cli commands. Cli setting `Align_mag` will then be ignored. For example `cw270flip`, so this value is to ADD manually. A sensor flip is always to realise over the pitch axis. For example:


```
set mag_align_pitch = 1800 set mag_align_roll = 0 set mag_align_yaw = 2700 save
```

*For 30 Degree Backwards tilted GPS/Compass Module, reduce mag_align_roll about 300

```
set mag_align_roll = -300 save
```

*Because Magnetometer with cw270° has its roll axis in relation to the Pitch Axis of the FC

15.1 Pin Lay-out + LED



Pin Description:

PIN	PIN Name	I/O	Description
1	SDA	O	Compass SDA
2	GND	G	Ground
3	TX	O	Serial Data Output.
4	RX	I	Serial Data input.
5	VCC	I	3.0V~ 5.5V supply input, Typical: 5.0V
6	SCL	I	Compass SCL

LED:

- 1.TX LED:blue.The data output, TX LED flashing
- 2.PPS LED:red.PPS LED not bright when GPS not fixed. flashing when fixed.

15.2 Config

Nota: gps is mounted op 10 helling van voor naar achter.

15.3 Setup rth (Jushua Bartwell)

https://www.youtube.com/watch?v=B_Yl0wqRf68

15.4 Magnetometer declination

Auto set. Kijk na via mag_declination in cli.

Ref: <https://github.com/iNavFlight/inav/wiki/GPS--and-Compass-setup>

15.4.1 Menu configuration

GPS

Note: Remember to configure a Serial Port (via Ports tab) when using GPS feature.

GPS for navigation and telemetry ?

UBLOX7 Protocol

Autodetect Ground Assistance Type

15.4.2 Menu ports

UART1 MSP 115200 Disabled AUTO Serial RX GPS 115200 Disabled 115200

15.4.3 Menu gps

GPS

Fix type:	None
Altitude:	-17 m
Latitude:	0.0000 deg
Longitude:	0.0000 deg
Speed:	0 cm/s
Sats:	0
Dist to Home:	0 m

GPS Statistics

HDOP:	99.99
EPH:	99.99 m
EPV:	99.99 m
Update time:	10.0 Hz
Total messages:	961
Errors:	0
Timeouts:	2

Current GPS location

Center

15.4.4 Menu, Advanced tuning, position estimator

6 Min. GPS satellites for a valid fix

16 Buzzer Vifly Finder 2

16.1 Short spec

https://www.banggood.com/Vifly-Finder-5V-Super-Loud-Buzzer-Tracker-Over-100DB-Built-in-Battery-for-Flight-Controller-RC-Drone-p-1329066.html?rmmds=myorder&cur_warehouse=CN

+/- 16 EUR.

Specification:

Brand Name: Vifly

Model: Finder 2

Item Name: 5V Buzzer for RC Drone

- Built-in Battery & LED Light

Volume: Up to 105dB

Working Time: Up to 30 Hours

Charge Time: 1.5 Hours

Battery: 80mAh Lipo

Input Voltage: 4.5-8.5V

Size: 24x13x16mm

Weight: 5g

Features:

- VIFLY Finder 2 **can power itself to beep** even the quad battery has been ejected.
- It **built-in light sensor** can detect light intensity and then smartly control the LED light to flash.
- **Buzzer automatically enter into sleep mode at night** to save power and not disturb.

- **Much Louder than Standard Buzzer**
To easily find the crashed quad in long distance, VIFLY Finder 2 is designed to install a very loud beeper that the dB is over 100.

- **Two Options to Disarm the Buzzer**
Option 1, Disarm with button: Disconnect main battery, hold disarm button on VIFLY Finder 2 for 1-5 seconds then release.
Option 2, Disarm with main battery: Disconnect main battery, then connect main battery for 3-6 seconds and disconnect it again.

- Compatible with Both FPV quadcopter and RC Airplane
VIFLY finder 2 is programmed to be **compatible with any flight controllers to support FPV quad, and receivers for RC airplane**.
No extra setting required, it will **automatically recognize** the device to connect.

16.2 Review

Tekst Oscar Liang: <https://oscarliang.com/vifly-finder-2-buzzer/>

16.3 Power lost

When power is lost it will be activated automatically:

- First 40 seconds – beeps in low volume (around 96dB)
- 40 seconds to 2 hours – beeps every 4 seconds at full volume (106dB)

- beyond 2 hours – beeping frequency reduced to every 10 seconds

16.4 Config

Buzzer vesterkt geluid FC. Thuis is dat minder aangewezen. Daarom

beeper -ON_USB

- ➔ Geen geluid uit buzzer van FC als usb is aangesloten. Zie ook <https://github.com/iNavFlight/inav/blob/master/docs/Buzzer.md>

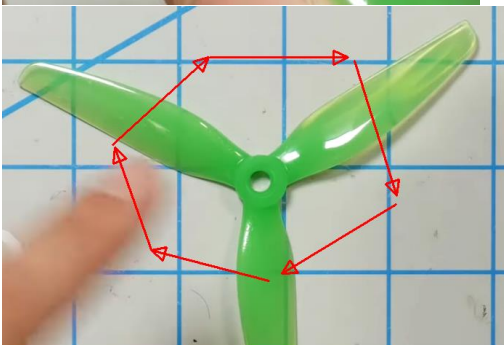
17 Props

17.1 mounting

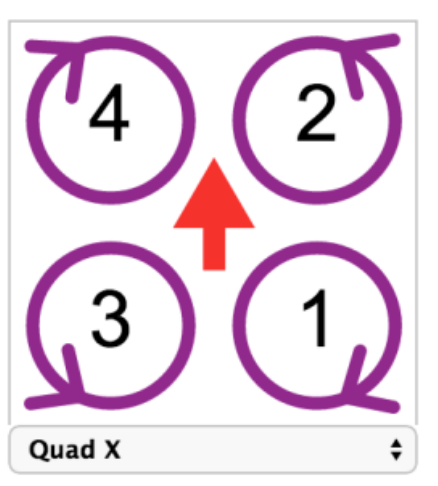
Zie eenvoudige video <https://www.youtube.com/watch?v=xKqWaRpg8>

Zie Jushua Bartwell video: https://www.youtube.com/watch?v=nc1QG_Njo7Y

- Prop bovenkant heeft meestal “letters”. Ook kan je kijken naar vorm.
- Draairichting: “Leading edge high, trailing edge low” zodat lucht @draaien naar beneden wordt geduwd.
- “Props out” van centerline naar buiten draaien of “props in” van center naar binnen. (= tekening hier onder). Centerline: lijn van voor naar achter quad.
- Diagonaal steeds dezelfde props. Naast mekaar: steeds verschillende props.
- Controle: zie video JB ~7’20”



- Zet drone met camera naar voor en achterkant naar jou



- Begin rechts achter. Idem links voor
- Cc links achter en rechts voor.

17.2 Type used (Gemfan HurriHurricane 51466)

https://www.banggood.com/2-Pairs-Gemfan-Hurricane-51466-5-Inch-Durable-3-Blade-Propeller-Support-POPO-for-RC-Drone-FPV-Racing-p-1441956.html?rmms=myorder&ID=515406&cur_warehouse=CN

Prijs Bangood: €5.07 / 4stuks -33%; -5% per 2 en -20% per 5 pakjes van 4 → €2.71 / 4 stuks. + verzending

Shop All Categories > Flash Deals 1-Week Delivery New Arrivals Under \$9.99

Home > Toys Hobbies and Robot > RC Parts > Multi Rotor Parts

2 Pairs Gemfan Hurricane 51466 5 Inch Durable 3-Blade Propeller Support POPO for RC Drone FPV Racing - Pink

Brand: Gemfan ★★★★★ 193 Reviews | 6 answered questions ID: 1441956

Price: **2,71€** ~~5,07€~~ 33% Off

Promo: **SALE** Buy 2pcs get 5% off

Ship From:

Color:

Dispatch: **In stock.** Processing time: Ships in 24 hours

Shipping: **2,21€** to Belgium via Air Parcel Register Shipping time: 20-35 business days

Quantity:

Prijs droneshop.nl: <https://droneshop.nl/gemfan-hurricane-51466-popo-propellers-4-stuks>

€2.95 + verzending.

17.2.1 review in nl

<https://www.fpv-racingtwente.nl/review-van-de-gemfan-hurricane-51466-propeller/>

type: Hurricane 51466 POPO Propellers

Materiaal: Polycarbonaat.

Gewicht: 4.1 Gram

Type bis: 5.1 inch met pitch? Speed: 4.66

17.2.2 Review droneshop:

Deze set bestaat uit 4 stuks Gemfan Hurricane 51466 POPO propellers en zijn speciaal ontworpen voor race- en freestyle-quadcopters. Hierbij is gebruik gemaakt van Catia, een 3D-ontwikkelprogramma uit de vliegtuigindustrie en Ansys Fluent, een programma waarin berekeningen en simulaties voor propellers gedaan worden.

51466

De Gemfan Hurricane 51466 POPO propellers zijn ontwikkeld om een zeer hoge mate van agiliteit bij een hoge vliegsnelheid te bieden. Door zijn lagere gewicht en kleinere bladoppervlak ten opzichte van de Gemfan 51499 POPO propeller, is de Gemfan 51466 POPO propeller naast een geschikte propeller voor een race-quadcopter ook geschikt om als freestyle-propeller gebruikt te worden.

POPO compatible

De Gemfan Hurricane 51466 POPO propellers zijn ontworpen om gebruikt te kunnen worden op motoren met het POPO systeem. POPO is de afkorting voor de "Pop On, Pop Off"-techniek waarbij propellers in een handomdraai op de motoren kunnen worden geïnstalleerd. Dit betekent niet dat deze propellers niet op een motor gemonteerd kunnen worden met een normale as, ook hierop kunnen de Gemfan Hurricane 51466 POPO propellers uitstekend gemonteerd worden.

Race-quadcopters

Deze Gemfan Hurricane 51466 POPO propeller is door zijn hoge pitch het beste geschikt voor race-quadcopters.

3-blade

Deze Gemfan Hurricane 51466 POPO propellers zijn uitgevoerd in een 3-blade design; dit wil zeggen dat iedere propeller is uitgevoerd met drie bladen.

2 x CW + 2 x CCW

Iedere set bestaat uit 4 stuks propellers: 2 ClockWise- (rechtsom) propellers + 2 Counter-ClockWise-(linksom) propellers.

Materiaal

Deze Gemfan Hurricane 51466 POPO propellers zijn gemaakt van polycarbonaat dat zorgt voor een hoge flexibiliteit en duurzaamheid. De Gemfan propellers kunnen dan ook tegen een stootje!

Kleur

Deze propellers zijn verkrijgbaar in verschillende kleuren.

Gemfan

Gemfan is één van de leidinggevende fabrikanten op het gebied van propeller voor quadcopters en drones. Met het gebruik van hoogwaardige software- en designtechnieken levert [Gemfan](#) kwalitatief zeer goede en vooruitstrevende producten voor de piloot.

2 Pairs Gemfan Hurricane 51466 5 Inch Durable 3-Blade Propeller Support POPO for RC Drone


Specification:

Brand Name: Gemfan
Item Name: 51466 5 Inch Durable 3-Blade Propeller
Model: Hurricane 51466
Size: 51
Gradient: 46.6
Blades: 3 blades
Material: polycarbonate
Mounting: 5mm center hole and PoPo compatible
Quantity: 2 CW & 2 CCW

Package Included:

2x Hurricane 51466 Propeller CW
2x Hurricane 51466 Propeller CCW

Toys Hobbies and Robot > RC Parts > Multi Rotor Parts



2 Pairs Gemfan Hurricane 51466 5 Inch Durable 3-Blade Propeller Support POPO for RC Drone
FPV Racing - Transparent Blue
Brand: Gemfan ★★★★★ 182 Reviews | 6 answered questions ID: 1441956

Price: **3,30€**

Promo: **SALE** Buy 2pcs get **5% off**


Ship From: **CN**

Color: Green Lemon yellow Pink Red Transparent Blue Transparent Grey
 Transparent White

Shipping: In stock. Processing time: Ships in 24 hours
4,84€ via **Priority Direct Mail** Shipping time: 10-20 business days

17.2.3 Nuts (moer)

- M5 formaat, CW draad nodig. Best met nylon binnenkant.
- Zie banggood: https://www.banggood.com/5-PCS-Gofly-RC-M5-Aluminum-Motor-Screw-Nuts-Nylon-Insert-Self-Lock-CWCCW-for-RC-FPV-Racing-Drone-p-1242985.html?rmmds=search&ID=22945905&cur_warehouse=CN



5 PCS Gofly-RC M5 Aluminum Motor Screw Nuts Nylon Insert Self Lock CW/CCW for RC FPV Racing Drone - Blue CW
★★★★★ 399 Reviews | 13 answered questions ID: 1242985

Price: **3,44€** ~~3,52€~~

Promo: **SALE** Buy 2pcs get **7% off**

Ship From: **CN**

Color: Black Blue Green Red Silver

Model: CCW CW

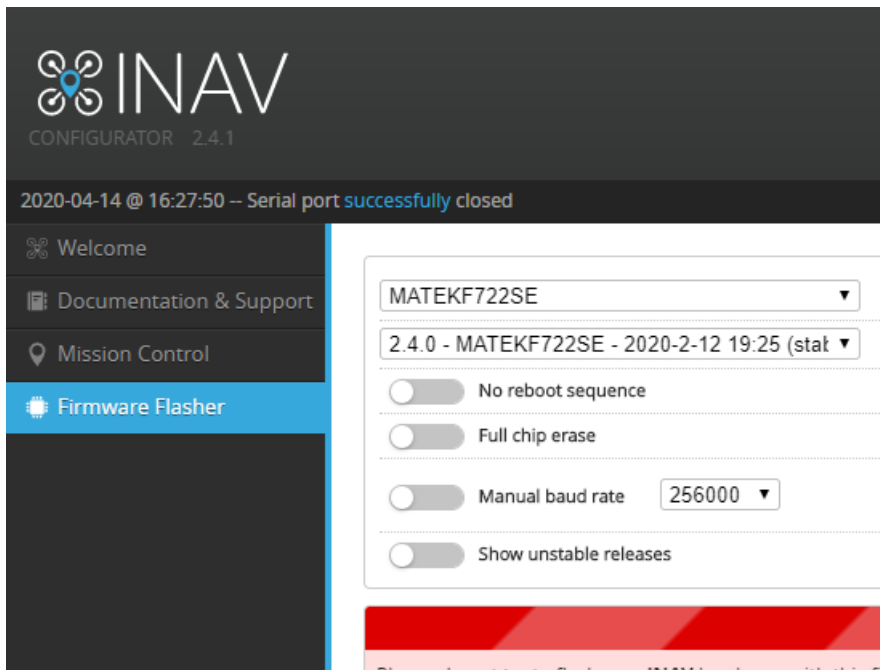
18 Inav

Inav download: <https://github.com/iNavFlight/inav-configurator/releases>

➔ Zie download bij assets.

18.1 F722-SE firmware

Open inav configurator en selecteer “matec F722se firmware”. Flash firmware.



18.2 Default config (gps quad)

Selecteer in “configuration een gps quad”.

Nota: dit overschrijft heel wat config.

18.3 Ander config

Zie handleiding: <https://github.com/iNavFlight/inav/wiki/Multirotor-guide>

18.3.1 Setup mixer

18.3.2 Callibreer acc

Zie tekst: <https://github.com/iNavFlight/inav/wiki/Sensor-calibration>

Zie video: <https://github.com/iNavFlight/inav/wiki/Sensor-calibration>

Dit doet geen level config!

18.3.3 Board Orientation and Level Calibration

Zie <https://github.com/iNavFlight/inav/wiki/Sensor-calibration>

18.3.4 Compass Calibration

18.3.5 Gyroscope Callibration

18.3.6 Setup uart

Ports

DOCUMENTATION FOR iNAV

Note: not all combinations are valid. When the flight controller firmware detects this the serial port configuration will be reset.
Note: Do NOT disable MSP on the first serial port unless you know what you are doing. You may have to reflash and erase your configuration if you do.

Identifier	Data	Telemetry	RX	Sensors	Peripherals
USB VCP	<input checked="" type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	Disabled ▼ 115200 ▼	Disabled ▼ 115200 ▼
UART1	<input type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	GPS ▼ 115200 ▼	Disabled ▼ 115200 ▼
UART2	<input type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input checked="" type="checkbox"/> Serial RX	Disabled ▼ 115200 ▼	Disabled ▼ 115200 ▼
UART3	<input type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	Disabled ▼ 115200 ▼	TBS SmartAudio ▼ 115200 ▼
UART4	<input type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	Disabled ▼ 115200 ▼	RunCam Device ▼ 115200 ▼
UART6	<input type="checkbox"/> MSP 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	Disabled ▼ 115200 ▼	ESC output/telemetry ▼ 115200 ▼

18.3.7 Configuration menu

Zie Jochua Bardwell video:

<https://www.youtube.com/watch?v=1x1zEUMZ7cc&list=PLwoDb7WF6c8nj7G3o9NJpZVPPTsw2z-Jy&index=20>

- ➔ Ga naar 14' tot 15': ivm hoe check compass flip/not flip + change 90/180/270 degrees.
- ➔ Zie stick commands

The screenshot displays the iNAV configuration interface. On the left, the 'System configuration' section includes a green warning box about propeller size, a '256Hz' Gyroscope LPF cutoff frequency, a yellow warning box about PID loop stability, and a '4kHz' Flight Controller Loop Time. Below this are 'Sensors' (MPU6000, HMC5883, BMP280, ADC, NONE) and 'Board and Sensor Alignment' (Roll, Pitch, Yaw, MAG Alignment). The 'Receiver Mode' is set to 'Serial-based receiver (SPEKSAT, SBUS, SUMD)'. On the right, the 'Battery Voltage' section has 'Battery voltage monitoring' enabled, with 'Raw' as the voltage source, 0 cells, 4.3V max cell voltage, 3.3V min cell voltage, 4.2V max cell voltage, 3.5V warning cell voltage, 1100V scale, and 15.50V battery voltage. The 'Current Sensor' section has 'Battery current monitoring' enabled, with a 179mV scale, 0mV offset, and 1.62A battery current. The 'Battery Capacity' section shows 'mAh' units, 1550mAh capacity, 20% warning capacity, and 10% critical capacity.

Nota: minium cell voltage: volgens lua telemetry: 3.4. Volgens matec 3.3

Nota: Voltage scale is hier 1100 ipv 110 bij BF.

18.3.8 CLI commando's: beeper

<https://github.com/iNavFlight/inav/blob/master/docs/Buzzer.md>

beeper -ON_USB

18.3.9 CLI commando disable safety when arming

<https://github.com/iNavFlight/inav/issues/4489>

Set nav_extra_arming_safety = off

18.3.10 Overview cli commands

<https://github.com/iNavFlight/inav/blob/master/docs/Cli.md>

18.4 Achtergrond Verschil Oneshot / dshot / enz

Zie tekst <https://robu.in/what-is-oneshot-and-multishot-in-esc-difference-between-oneshot-and-multishot-esc-esc-calibration-protocol/>

18.5 Failsave setup

Zie procedure <https://github.com/iNavFlight/inav/wiki/Failsafe#setting-up-failsafe-with-return-to-home>

18.6 Modes

18.7 Te programmeren

- Angle / horizon
- Nav alt hold (for gps): zie https://www.youtube.com/watch?v=ha9haq_elcs
- Nav pos hold (for gps)
- Nav RTH (for gps)
- GEEN Black box opzetten.
- Overview modes in inav: <https://github.com/iNavFlight/inav/wiki/Navigation-modes>

Mode	SwitchA	SwitchB	Kanaal
Alt hold	SA ↑	SB ↑	CH8
Horizontaal	SA ↑	SB -	CH8
Angle / Acro	SA ↑	SB ↓	CH8
Pos Hold	SA -	SB ↑	CH8
RTH	SA -	SB -	CH8
---	SA -	SB ↓	CH8
Pos Hold + OSD SW	SA ↓	SB ↑	CH8
Way point	SA ↓	SB -	CH8
BUZZER	SA ↓	SB ↓	CH8
ARM	SF ↑		CH5
Kill Switch	SI indrukken		CH6
Headless Adjust	SE ↓ (nr ond)		CH7
---	SE -		CH7
Headless	SE ↑ (nr bvn)		CH7

Nota: op Taranis (en niet via inav): P1 = volume

SD: vbat en rssi uitspreken.

18.8 Cli uittreksel

aux

aux 0 0 0 1800 2100

aux 1 1 3 1275 1375

aux 2 2 3 1075 1200

aux 3 5 4 1800 2100

aux 4 6 4 900 1200

aux 5 3 3 900 1050

aux 6 9 3 1375 1525
aux 7 9 0 1750 1875
aux 8 8 3 1550 1700
aux 9 19 3 1850 1950
aux 10 11 3 1950 2075
aux 11 15 3 1725 1875
aux 12 23 1 1875 2075

18.9 Welke positive is de switch

A three position switch with positions:

- SW↑ Up/Away from the user
- SW– Middle/Centre
- SW↓ Down/Towards the user

Zie <http://rcdiy.ca/opentx-transmitter-firmware/radio-menus/hardware/#Multipos> voor details on alle knoppen.

➔ Opgelet: switch E is omgekeerd!

18.10 Info rond telemetry modes tmp1

BF <https://github.com/betaflight/betaflight/blob/master/docs/Telemetry.md>

Zie inav <https://github.com/iNavFlight/inav/blob/master/docs/Telemetry.md> maar hou in het achterhoofd dat dit verouderd is. Niet alle modes zijn ok. Zo is acro “xxx0x”

Tmp1	<p>actual flight mode, sent as 4 digits. Number is sent as (1)1234. Please ignore the leading 1, it is just there to ensure the number as always 5 digits (the 1 + 4 digits of actual data) the numbers are aditives (for example, if first digit after the leading 1 is 6, it means GPS Home and Headfree are both active)</p> <ol style="list-style-type: none">1. 1 is GPS Hold, 2 is GPS Home, 4 is Headfree2. 1 is mag enabled, 2 is baro enabled, 4 is sonar enabled3. 1 is angle, 2 is horizon, 4 is passthrough4. 1 is ok to arm, 2 is arming is prevented, 4 is armed
Tmp2	<p>GPS lock status, Number is sent as 1234, the numbers are aditives</p> <ol style="list-style-type: none">1. 1 is GPS Fix, 2 is GPS Home fix2. HDOP (0-9, 0 is HDOP >= 5.5m, 9 is HDOP <= 1.0m)3. number of sats4. number of sats

Via taranis telemetry lua kan je modes laten uitspreken:

<https://github.com/iNavFlight/LuaTelemetry/wiki/Screen-Description>

Zie in C:\Users\johan\Downloads\LuaTelemetry-master\LuaTelemetry-master\src\iNav\modes.lua

```
-- Modes: t=text / f=flags for text / w=wave file
local modes = {
  { t = "! TELEM !", f = 3 },
  { t = "HORIZON", f = 0, w = "hrznmd" },
  { t = " ANGLE", f = 0, w = "anglmd" },
  { t = " ACRO", f = 0, w = "acromd" },
  { t = " NOT OK ", f = 3 },
  { t = " READY", f = 0, w = "ready" },
  { t = "POS HOLD", f = 0, w = "poshld" },
  { t = "WAYPOINT", f = 0, w = "waypt" },
  { t = " MANUAL", f = 0, w = "manmd" },
  { t = " RTH ", f = 3, w = "rtl" },
  { t = "! FAIL !", f = 3, w = "fson" },
  { t = "! THROT !", f = 3 },
  { t = " CRUISE", f = 0, w = "cruzmd" }
}

local units = { [0] = "", "V", "A", "mA", "kts", "m/s", "f/s", "kmh", "MPH", "m", LCD_W >= 480 and "ft" or "" }

local labels = { "Fuel", "Battery", "Current", "Altitude", "Distance" }

return modes, units, labels
```

Wave files staan in: C:\Users\johan\Downloads\LuaTelemetry-master\LuaTelemetry-master\dist\SCRIPTS\TELEMETRY\iNav\en

18.11 Ongecatalogeerde info

Testing modes: zie video <https://www.youtube.com/watch?v=NPvbeHBZtPA>

Zie tekst oscar liang <https://oscarliang.com/rate-acro-horizon-flight-mode-level/>

Sound files http://open-txu.org/wp-content/uploads/2014/11/Scott_Taranis_File_Storage_Final.pdf

18.12 Black Box logging

Zie tekst: <https://github.com/iNavFlight/inav/wiki/INAV-blackbox-variables>

Joshua Bardwell just started a new video series which he calls BlackBox 101:

<https://www.youtube.com/playlist?list=PLwoDb7WF6c8l0-ABslcnJt1FyhX9MBoVW>

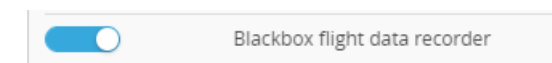
<https://github.com/iNavFlight/blackbox-log-viewer>

18.12.1 Setup

- Format SD-card (fat32, 32kb standaard) met SD-card formatter tool.

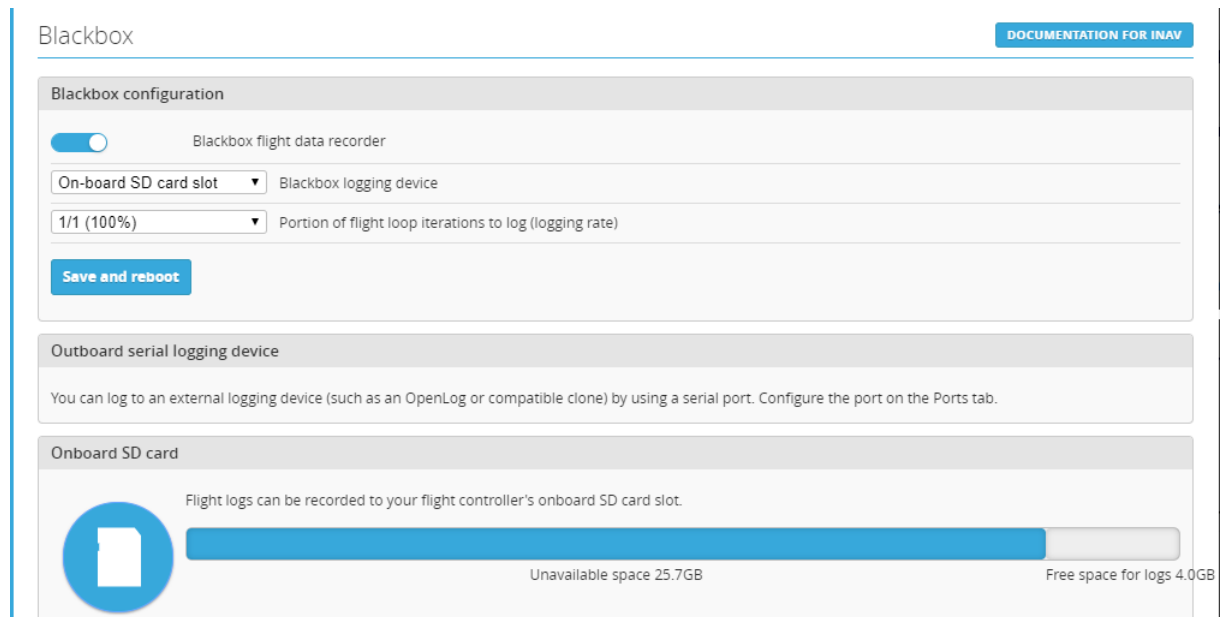
format tool: <https://www.sdcard.org/downloads/formatter/>

- Steek SD-card in slot van de flight controller
- In menu configuratation: enable blackbox logging



- In menu Blackbox:

Nota: ondanks mijn 32Gb card, is slechts 4Gb beschikbaar voor logging. Zie matec info <http://www.mateksys.com/?p=5159>



- Flight mode: GEEN blackbox mode opzetten: er wordt dan immers altijd, automatisch gelogd.

18.13 Inav Mission Planner

Video algemeen: https://www.youtube.com/watch?v=h_NGqleRpMw

<https://github.com/stronnag/mwptools>

18.14 Inav bug 4kHz & hoge cpu

Zie <https://github.com/iNavFlight/inav/issues/4121>

Oplossing: freq op 2 khz.

19 Taranis openTX

19.1 Taranis Logging

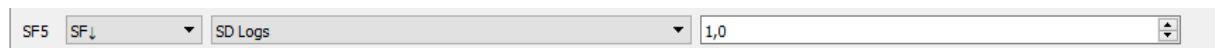
Zie tekst Oscar Liang: <https://oscarliang.com/log-gps-coordinates-taranis/>

Uitleg rond variabelen: <https://opentx.gitbooks.io/opentx-taranis-manual/telemetry.html>

19.1.1 Auto logging

Zie statussymbool: https://opentx.gitbooks.io/opentx-taranis-manual/main_views.html

@arm zet automatisch logging aan: (SF is arm switch)



Visueel zichtbaar dat logging aan staat:



Taranis logfile: SD-card, \logs\MatecJVD1_v3-2020-04-18.csv

19.2 Terugvinden drone

Zie tekst: <https://oscarliang.com/find-lost-quadcopter/>

Taranis logfile: SD-card, \logs\MatecJVD1_v3-2020-04-18.csv

19.3 Telemetry

19.3.1 LUATElemetry

Zie <https://github.com/iNavFlight/LuaTelemetry/wiki/Screen-Description>

To do: zet in tx de settings ok (niet mogelijk wegens bug)

Zie <https://github.com/iNavFlight/LuaTelemetry/wiki/Suggested-Battery-Settings>

In Lua Telemetry

- Cell Low: **3.5V** (match "Warning cell voltage" in INAV)
- Cell Critical: **3.4V** (match "Minimum cell voltage" in INAV)
- Fuel Unit: **Percent**
- Fuel Low: **30%** (match "Warning capacity" in INAV)
- Fuel Critical: **20%**

Nota: correcte waarden zijn :

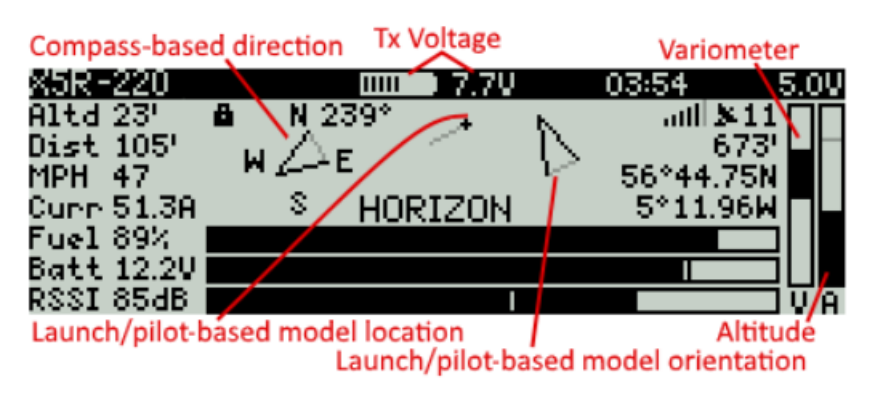
4,3	Maximum cell voltage for cell count detection
3,3	Minimum Cell Voltage
4,2	Maximum Cell Voltage
3,5	Warning Cell Voltage

19.3.2 Batt settings inav

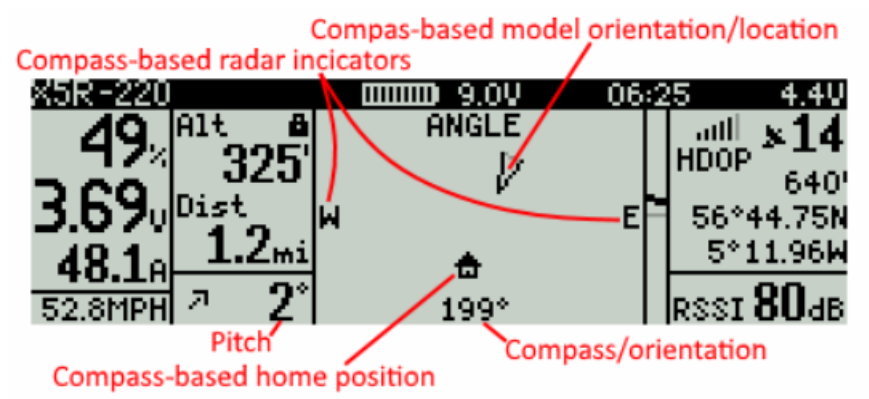
Zie <https://github.com/iNavFlight/LuaTelemetry/wiki/Suggested-Battery-Settings>

set smartport_fuel_unit = PERCENT (resterende capaciteit is getoond; bij mah wordt het % dat je gebruikt hebt getoond)

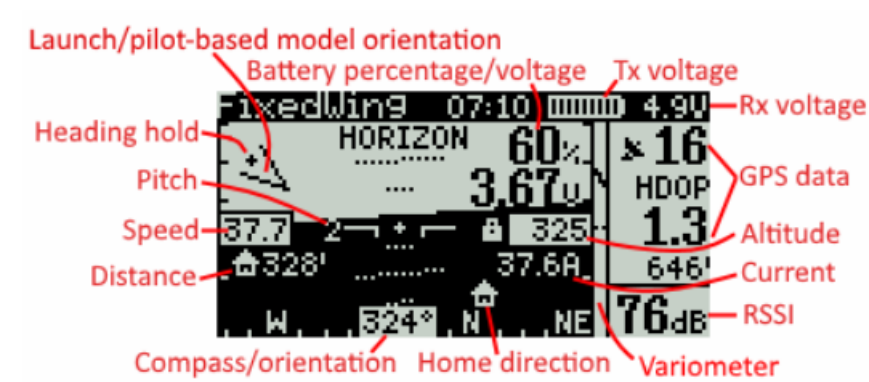
Classic view:



Radar (map view):



Pilot (glass cockpit) view:



19.4 Bluetooth module

Zie video <https://www.youtube.com/watch?v=fyT6XohZIsY>

=====

Zie <https://github.com/CrazyDude1994/android-taranis-smartport-telemetry/issues/4>

I have a X9D SE 2019 with internal BLE. I guess the connection should be similar to x10s.

1.- Configure the Transmitter BT as "Telemetry" (Setup/Hardware/Bluetooth = Telemetry)

2.- Change the name of the Bluetooth to Lowercase (IMPORTANT: this is a FrSky BT bug!). By default is "X9D": use x9d for instance

- 3.- Open the app and look for "Hello" (yes, it's confusing but it's the Taranis BT). Connect
- 4.- That's it: I have the app running OK

App: <https://github.com/CrazyDude1994/android-taranis-smartport-telemetry>

(momenteel kan ik geen connectie krijgen, ook al komt hello in de lijst.)

19.5 Joystick mode

Tekst Oscar Liang: <https://oscarliang.com/opentx-usb-joystick-mass-storage/>

Probleem met driver zie video: <https://www.youtube.com/watch?v=SDnRSL3rDwM>

En tekst: <https://www.rcgroups.com/forums/showpost.php?p=42723295&postcount=54967>

Symptom: After a Windows update, the game controller functions (joysticks, switches) no longer do anything in Windows.

Cause: Windows update installed a new driver "libusb0.sys" in "C:\windows\system32\drivers" which was now being used for the Taranis USB inputs.

Solution: Revert back to the previous Windows driver.

- Turn Taranis ON, and attach to PC via USB as normal for using flight simulator.
- Go to Control Panel > Devices and Printers. Right click on item "FrSKY Taranis..."
Select Properties > Hardware > USB Input Device > Properties > Change Settings > Driver > Update Driver > "Browse my computer..." > "Let me pick..."
- Windows had switched mine to "BETTER_USB_HS" (which in this case was NOT better!)
- I switched it back to "USB Input Device" and all is good again.

19.5.1 FPV freeride

Gratis demo: <https://fpv-freerider.itch.io/fpv-freerider>

Met video van deze demo : <https://www.youtube.com/watch?v=lZ53UiUOzcl>

Handleiding taranis : <https://drive.google.com/file/d/0BwSDHIR7yDwSOGhPMTFyWEpDVWM/view>

LiftOff and Taranis will work if ...

- 1) Taranis 9XD / 9XD+ / X9E have Firmware > OpenTX 2.0
- 2) You created "new model" and set internal RF to "OFF" (Page 2 Model Settings)
- 3) Set all Channels to 50% (Done in Page 4 Inputs by long pressing on each channel)
- 4) Set Weight 50% and Offset 50% for Thr, Yaw, Roll, Pitch
- 5) Use Calibration in LiftOff

This works for me on Win10 PC & Taranis X9D

19.5.2 Best sim

Zie tekst Oscar Liang: <https://oscarliang.com/free-quadcopter-simulator-drone-multirotor-trainer/>

19.5.3 How to learn acro

<https://www.youtube.com/watch?v=RSaPPGa626c>

19.6 Voice pack

Zie voor x7:

https://www.reddit.com/r/Multicopter/comments/7tsbri/i_made_a_complete_portal_sound_pack_for_opentx/

Met sound files op github: <https://github.com/jarethmt/Open-TX-Portal-Voice-Pack>

19.7 Combineren van schakelaars

Zie <https://www.youtube.com/watch?v=a3YDWxPPqT8>

Er zijn 2 methoden. De “moeilijke” is hier gekozen:

- 1) Laat gecombineerd kanaal vrij (ch8)

CH1	Thr Weight(+100%)	[Thr]
CH2	Ail Weight(+100%)	[Ail]
CH3	Ele Weight(+100%)	[Ele]
CH4	Rud Weight(+100%)	[Rud]
CH5	SF Weight(+100%) NoTrim	[Aux1Ar]
CH6	SI Weight(+100%) NoTrim	[Aux4KS]
CH7	SE Weight(+100%) NoTrim	[Aux5HL]
CH8		
CH9		

- 2) Programmeer logische switches

L30	AND	SA↑	SB↑	----	0,0	0,0
L31	AND	SA↑	SB-	----	0,0	0,0
L32	AND	SA↑	SB↓	----	0,0	0,0
L33	AND	SA-	SB↑	----	0,0	0,0
L34	AND	SA-	SB-	----	0,0	0,0
L35	AND	SA-	SB↓	----	0,0	0,0
L36	AND	SA↓	SB↑	----	0,0	0,0
L37	AND	SA↓	SB-	----	0,0	0,0
L38	AND	SA↓	SB↓	----	0,0	0,0

- 3) Zet output bij special funtions

SF30	L30	Override CH8	-100	ON
SF31	L31	Override CH8	-70	ON
SF32	L32	Override CH8	-35	ON
SF33	L33	Override CH8	-10	ON
SF34	L34	Override CH8	20	ON
SF35	L35	Override CH8	45	ON
SF36	L36	Override CH8	60	ON
SF37	L37	Override CH8	80	ON
SF38	L38	Override CH8	100	ON

- 4) Optioneel: programmeer flight modes om ze op Taranis zichtbaar te maken adh van logische switches. Voorlopig niet gedaan

19.8 Volumeregeling

Om het volume te regelen, moet je een waarde van 0 tot 100 regelen. Helaas is een “simpele standaard curve” niet ok. De simulatie werkt, maar de regeling gaat van 2 tot 3 streepjes ipv van off, 0 tot 3. Daarom gespeeld met de curve.

De curve is niet mooi vlak

simulator

0 -> off

51% -> 1 streepje

60% -> 2 streepjes

100% -> 3 streepjes

Echt

0 -> off

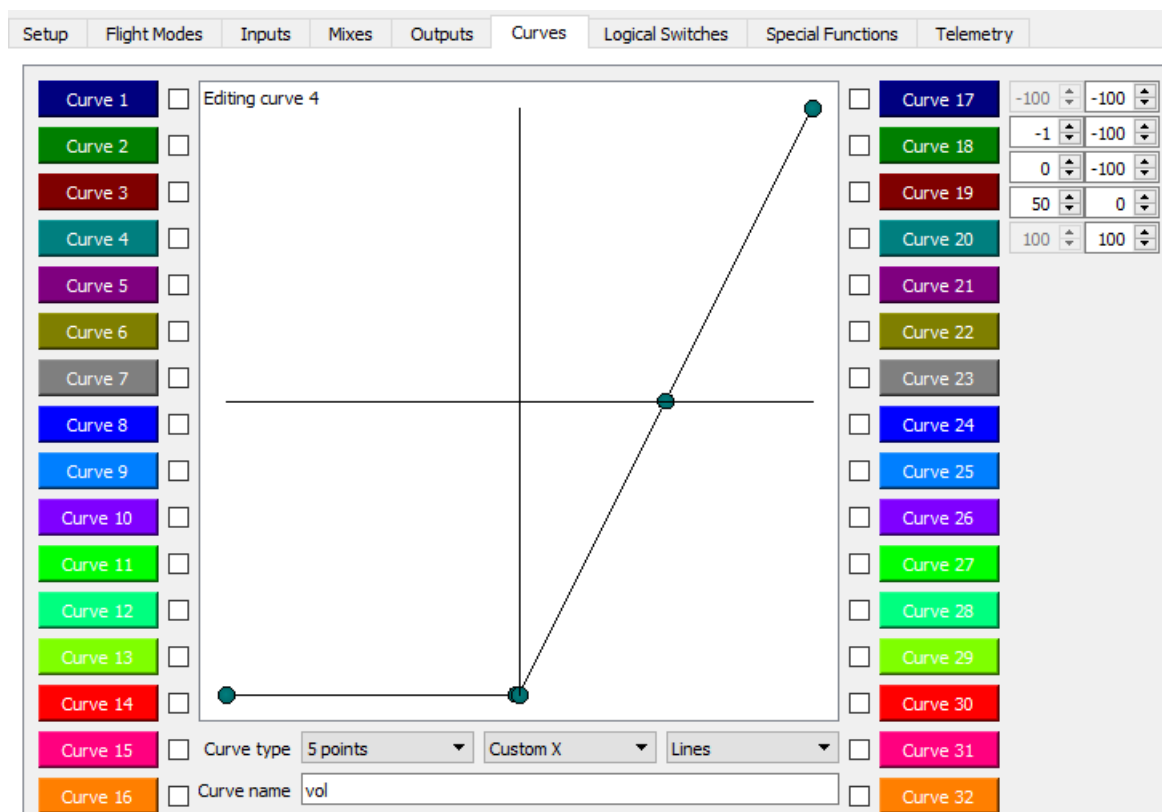
40% -> 1 streepje

50% -> 2 streepjes

75% -> 3 streepjes

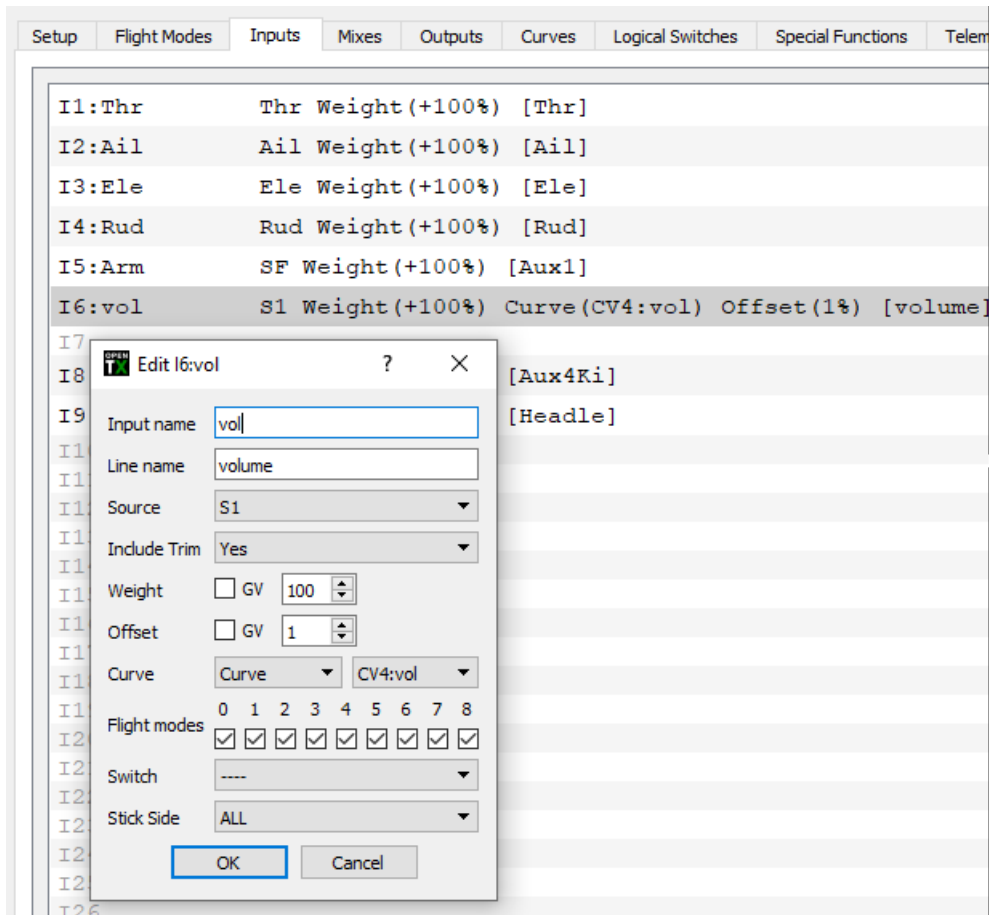
19.8.1.1 Volume curve

Maakt curve van 0 tot 100: cv4:vol



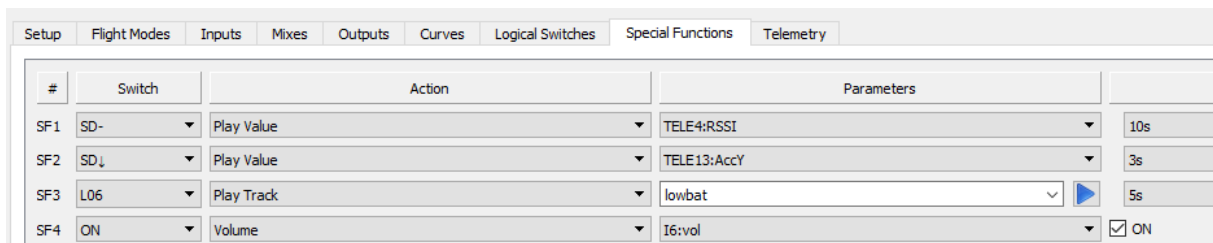
19.8.2 Input volume

Associeer input S1 (draaiknop) aan cv4:vol



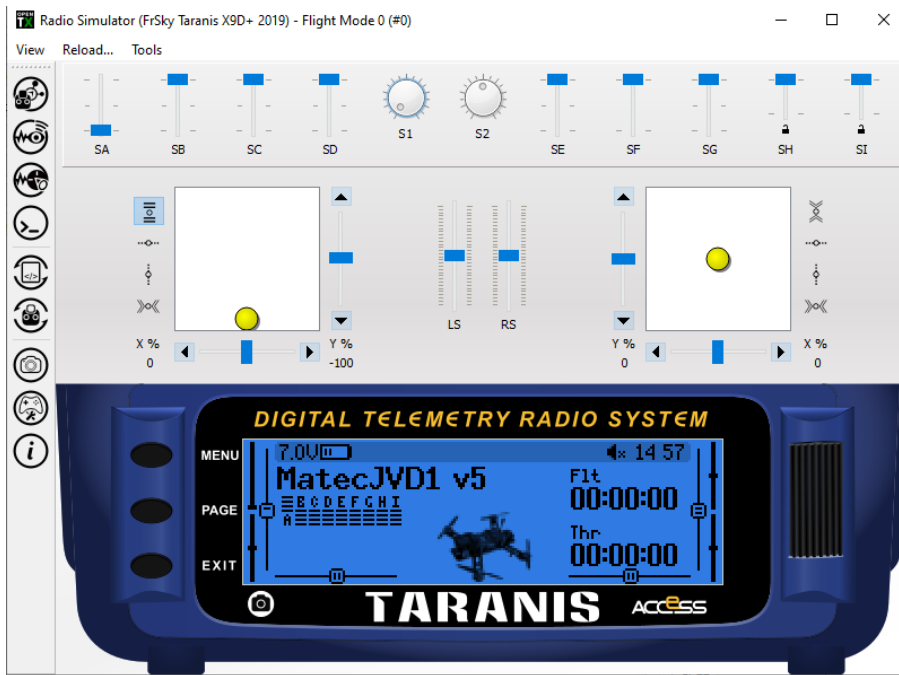
19.8.3 Special Function volume

Maak volumeregeling aan curve4 gelinkt via "input"

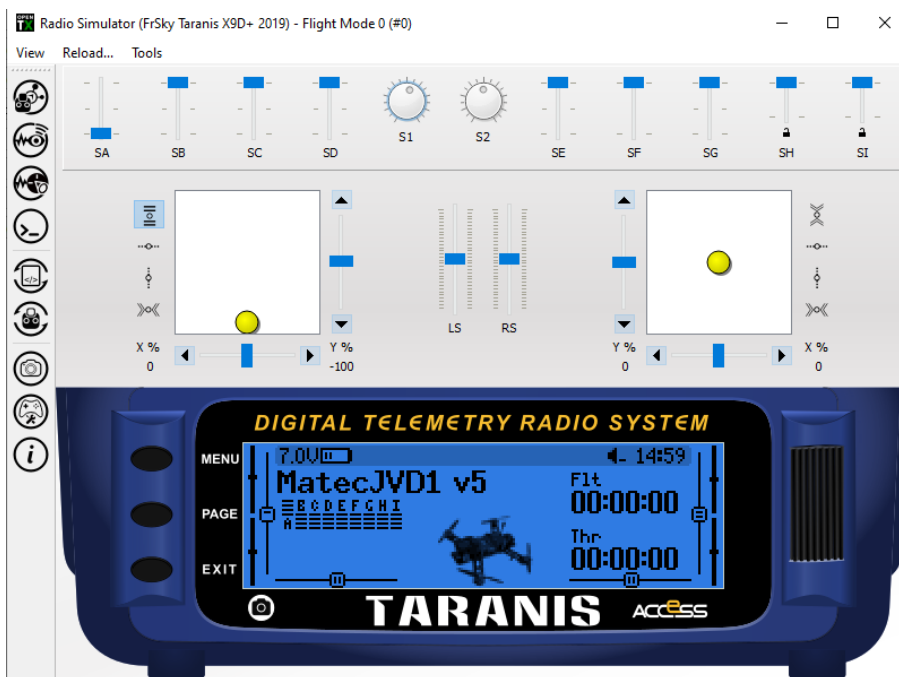


19.8.4 Controle volume

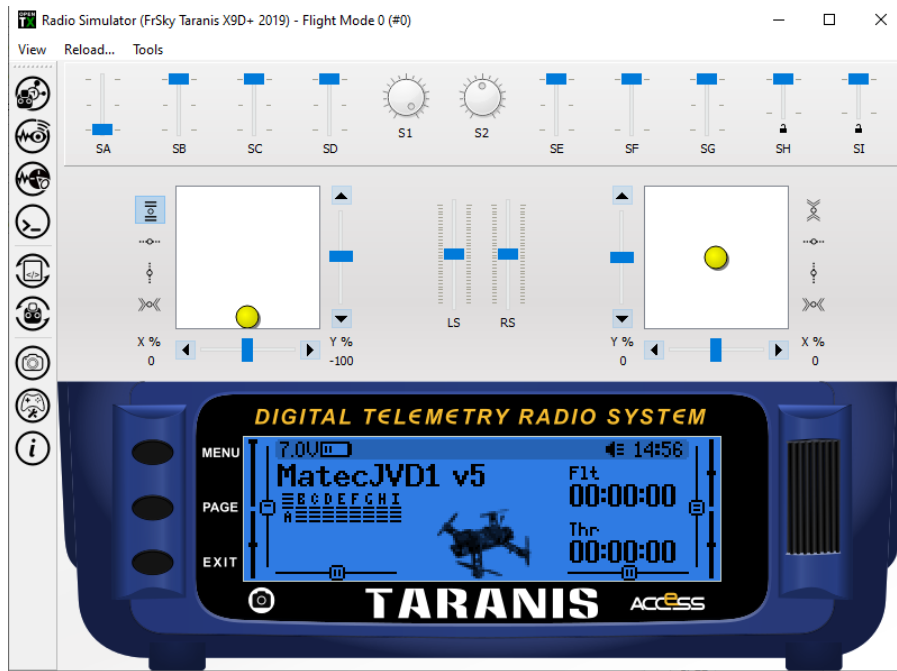
Zie S1 (min) → luidspreker op off (kruisje)



Zie S1 (iets over half) → luidspreker op half (1streepjes)



Zie S1 (max) → luidspreker op max (3streepjes)



20 Extra

20.1 Eerste vlucht

JB: <https://www.youtube.com/watch?v=vkM6VjmV6UU>

A few things: ALT_HOLD and POS_HOLD can be set as separate modes. So you can check POS_HOLD while managing altitude (throttle) manually. And check ALT_HOLD while managing position manually (angle mode). I would say, check POS_HOLD without ALT_HOLD first of all. Once you can trust it, put ALT_HOLD on a separate switch so you can work on it independently. Best done line-of-sight in a big field. I usually fly my INAV quad line-of-site as a fun break from FPV. There are PIDs for both ALT_HOLD and POS_HOLD, with an additional complication that ALT_HOLD can use both GPS and barometer. Seems to me the ALT_HOLD PIDs need work. Also, did you put foam over your barometer to eliminate propwash effects?