Q500log2kml user manual

**FlightLog data evaluation
for Yuneec quad or hex copter
Version 3.9**

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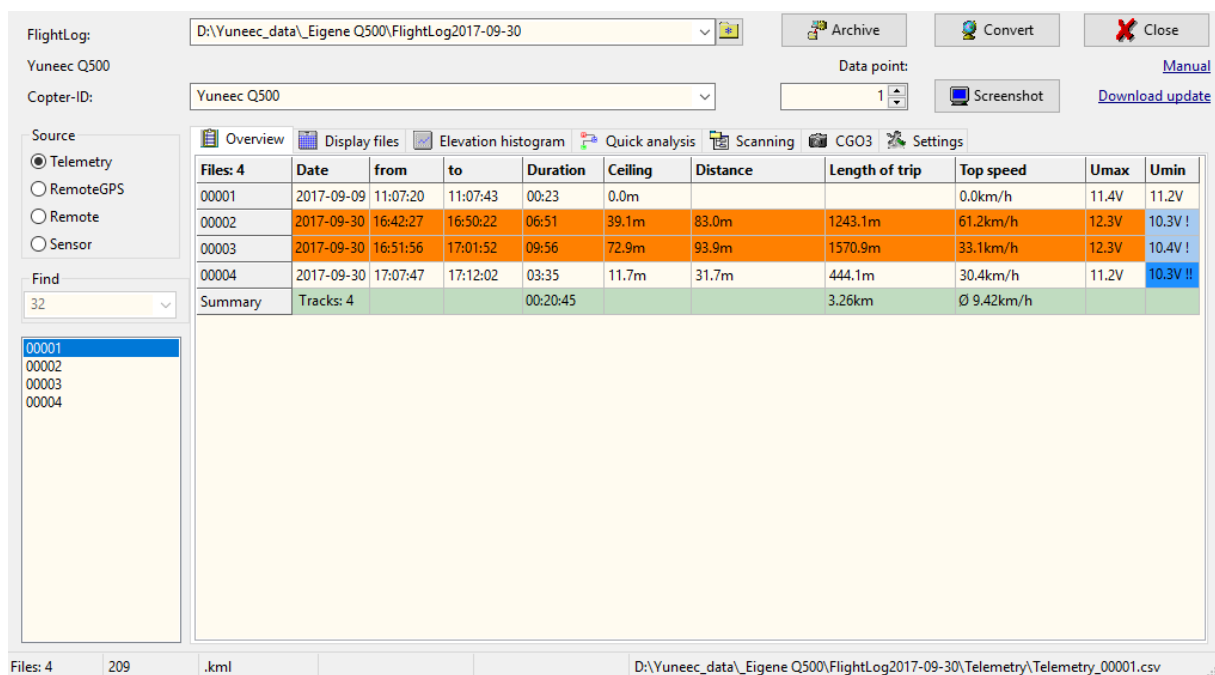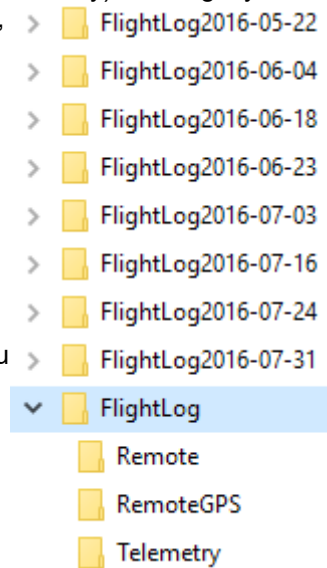Issue: 10/2018

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1   Introduction

This application was made to display and analyze FlightLog data (including Telemetry) from legacy Yuneec-driven copter (like Q500, H920, Typhoon H, Typhoon H Plus, Breeze, Mantis Q, but also Blade Chroma or Blade 350QX). The application is **not usable for H520** telemetry (tlog). The FlightLog data are available on ground station ST10 at the micro SD card. The slot for the micro SD card is located under the battery of the ST10. Format the SD card with FAT32 file system. You do not need a large or fast SD card, a cheap card is enough. For the ST16(S), no SD card is needed. FlightLogs (or Flight2Logs) are stored at the internal memory.

The FlightLog can be downloaded via micro USB connector. The telemetry/sensor data for copter, ground station and radio connection are stored in file structure called "FlightLog" or "Flight2Log" at ST16S or "FlyLog" at Mantis Q control device in different sub directories. For this application, you need to move or copy the whole FlightLog directory with all sub directories without any changes. For Yuneec Breeze the flight log is stored on the controller by the Pilot App. Yuneec Breeze has no sub directories.

It seems that data from ST12, ST16, ST16S or ST24 do also work with this application. **ST10 means all STxx RC-controllers.**

In overview table, FlightLogs with error flags during the flight are marked with orange background. Those needs a deeper view. Most of those error flags are Compass Calibration Warnings. For this analysis, the application can be used as all-in-one solution.

Important note: Use this application on your own risk. There is no guaranty for correctness and completeness of the results of the evaluation of flight log data.

Because this all was done by own tests and private researches, the interpretation of the data may be wrong.
On the other hand, this application is freeware. Have fun...

1.1 Features (short description)

- **Archive:** Rename the FlightLog directory by using a time stamp to avoid overwriting older data. This should be the first action if you move the FlightLog data from ST10 to your PC.
- **Convert:** Convert telemetry data from copter to KML- or KMZ-files (flight path for Google Earth), GPX for other map services, for import to DashWare in order to get telemetry data in videos, as CSV file for RaceRender or as CCC waypoint file.
- **Overview:** Some important information for the flights in a table form (ceiling, max. air speed, max. distance, warnings, etc).
- **Flight record**: Scan a whole directory for telemetry files and generate a flight record.
- **Search problem cases:** Scan a whole directory with FlightLogs for predefined known problem cases (like crashes or compass warnings). This is not available for Yuneec Breeze.
- **Display files:** Browse raw data of Telemetry, Remote, RemoteGPS or Sensor files. Use this for deeper analysis. There is no interpretation of the sensor files.
- **Search**: Search in a column of file display table. Depending on values in the columns, part of the search string or whole search string will be used to find something.
- **Elevation histogram:** Graphic elevation histogram and voltage curve. Cursor for analysis functionality.
- **Quick analysis:** Three different and select-able Histograms on the same tab sheet for quick overview and compare. Some useful profiles are available to speed-up your checks.
- **Cut files:** This function provides the possibility to cut out parts of the FlightLog and save it in a new FlightLog file set.
- **Analysis:** Analyze a predefined data area to see i.e. average speed, climb rate…
- **Control CGO3:** Test environment for commands to CGO3 via 5G WLAN connection.
- **Settings:** Three tab sheets for commission settings of the application.
- **AppLog:** Listing of actions, messages and errors from the application. For sensor files from the Typhoon H Plus or Mantis Q, text messages (MAV link "statustext") and some other data from different messages will be listed too.

1.2 Installation

No installation necessary, it is a portable application (only the binary needed). Simply unzip the downloaded file and store it to a directory where you have write access. This can also be a USB stick or a removable drive.

Download updates and user manual from my homepage.

To run the application, you might have to suppress Microsoft SmartScreen warnings: Click on "more info" and then "run anyway".

Installation auf MAC OS X:
Download and unzip archive. Start q500log2kml_EN.dmg. Open the DMG, read ReadMe file and drop both files q500log2kml into the Programs folder. Done, DMG can be closed and deleted.

Start application q500log2kml.app in program folder. If the application will not start, execute following script in terminal as administrator (Admin password is needed):
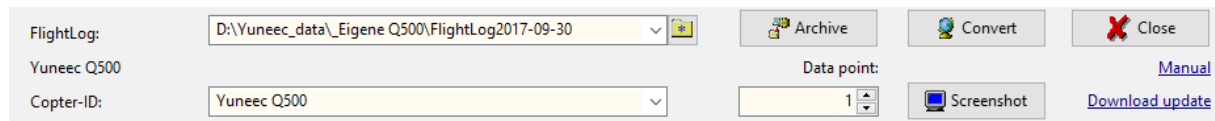```
sudo xattr -r -d com.apple.quarantine /Applications/q500log2kml.app
```

# 2 Detailed description of the features

## 2.1 Load/Read data

### 2.1.1 Main controls

In the header of the application window are the main input fields and controls.



- **FlightLog:** Select directory of FlightLog for analysis. The application saves the last six FlightLog directories that have been used in a drop-down list.
- **Copter-ID:** free text, select-able from "Saved models" (see Settings/Other settings/Saved models)
- **Archive:** Renames the FlightLog directory for archiving
- **Convert:** Starts batch converting of telemetry to selected output format
- **Data point:** Indicated the selected data set
- **Screenshot:** Takes a screenshot of the application window (not available for MAC OS X)
- **Manual:** Link to this manual (either local if available as local file, otherwise to internet)
- **Download update:** Link to application download repository
- **Close:** Quits the application
- Double click on a free space in the header calls the about box.
- Double click on status bar below will copy the text part to clipboard.
- Hold mouse pointer over a data cell, value or control to get hints and more information.

On the left side of the application are following controls:
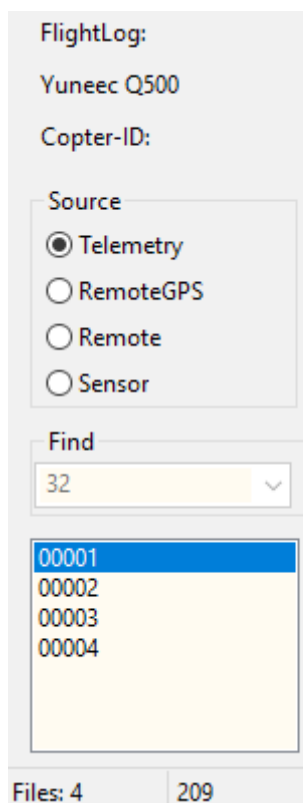


Between "FlightLog" and "Copter-ID", the **Vehicle type** will be shown. This is unlike the Copter-ID not editable.

**Source:** Select the file type you want to see. The data table remains empty if the related file is not available.
The Breeze has only one log file containing telemetry and settings. Thus, file selection is not available for Breeze.

**Find:** Input field to enter a value (text or numbers) to search for in the selected column or to filter datasets according search rules.

Below the "Find" section is a list field containing the **list of file numbers** that are available in the FlightLog directory. Each number will be counted as one flight although in a single file maybe more than one flight if only flight battery was changed.
Click on a file number to load the related FlightLog.
A double click reloads the whole list and jumps to the first file number.

### 2.1.2　Main menu

The main functions can also be called by main menu in application header. Some elements have context sensitive menu, called by right mouse button.

**File**
　Select FlightLog directory…
　Open working directory… (opens the file manager, same as double click on input field)
　Select flight record directory...
　Open flight record directory... (where the flight record was saved)
　Open Sensor file from PX4...
　Convert
　Archive
　Close

**Tools**
　Screenshot: Takes screenshot from the whole application window.
　　　　　　Not available for MAC OS X, please use CMD+Shift+4 instead)
　Make flight record (only if a valid flight record directory was selected before)
　Reset start/end (the next four menu items belong to FlightLog-cutting function)
　Set start
　Set end
　Cut files

**Help**
　Manual
　Homepage (my homepage)
　About Q500log2kml (same as double click on empty area of application header)


To load data to the application, **select the main directory (usually /FlightLog or Flight2Log)** where the FlightLog data are located in three (or four, if Sensor is available) different sub-directories: /Remote, /RemoteGPS, /Sensor and /Telemetry.
You can also Drag & Drop the directory from a file manager to the application window. Files will be checked and an overview in table form will be shown at tab sheet "Overview". Files or directories must not be write-protected.

The numbering of sensor files for Typhoon H Plus meets not the numbers of the FlightLog. Those sensor files can only be opened and displayed as single file by menu item "Open Sensor file from PX4...".

## 2.2 Overview

The row 'Total' contains:
- Number of flights. Each telemetry file will be counted as one flight no matter if there was an additional landing in between.
- Duration of the real flight without times on the ground. Time will be added if there is valid flight mode in the telemetry data.
- Then sum of the length of all trips. This will be computed only from GPS data and may not be exact.
- The average ground speed computed from trip length and flight times.

| Files: 4 | Date | from | to | Duration | Ceiling | Distance | Length of trip | Top speed | Umax | Umin |
|---|---|---|---|---|---|---|---|---|---|---|
| 00001 | 2017-09-09 | 11:07:20 | 11:07:43 | 00:23 | 0.0m | | | 0.0km/h | 11.4V | 11.2V |
| 00002 | 2017-09-30 | 16:42:27 | 16:50:22 | 06:51 | 39.1m | 83.0m | 1243.1m | 61.2km/h | 12.3V | 10.3V ! |
| 00003 | 2017-09-30 | 16:51:56 | 17:01:52 | 09:56 | 72.9m | 93.9m | 1570.9m | 33.1km/h | 12.3V | 10.4V ! |
| 00004 | 2017-09-30 | 17:07:47 | 17:12:02 | 03:35 | 11.7m | 31.7m | 444.1m | 30.4km/h | 11.2V | 10.3V !! |
| Summary | Tracks: 4 | | | 00:20:45 | | | 3.26km | Ø 9.42km/h | | |

Flights where error flags appeared will be marked as colored line. Voltage warnings are indicated by a "!" in the column "Umin".
Overview remains empty for Mantis Q.

To get additional information put the mouse pointer on a cell.

**Keyboard shortcuts:**

 Ctrl + c       Copy table to clipboard


The status bar at the bottom of the application window shows the following context-dependent data from left to right:
- number of files with telemetry data,
- number of data sets or selected data set in the file,
- output format for file conversion,
- state, messages or analysis results.

Usually there are for each flight three files in different sub-directories:
- Telemetry_*.csv in directory "\Telemetry": contains telemetry data sent by copter (selection: Copter).
- RemoteGPS_*.csv in directory "\RemoteGPS": contains GPS data from STxx ground station (Selection: RC).
- Remote_*.csv in directory "\Remote": contains the values, that are transmitted over the RC connection (selection: Radio). Stick values greater that neutral (2048) are marked with blue color, stick values smaller than neutral position are green.
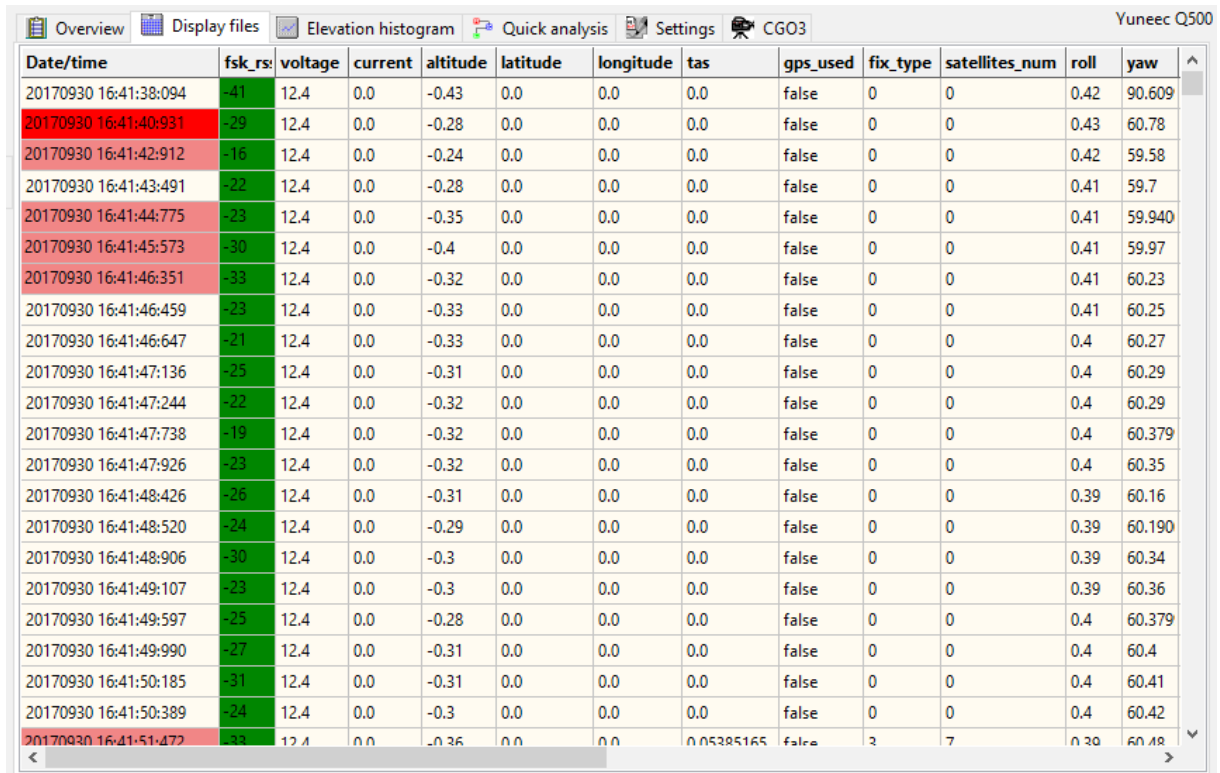
Each address field and also the find criteria field contains a drop-down list with the last used values. It can be deleted by holding the CTRL key and clicking on the field.

## 2.3 Display files

You can see those raw data at tab sheet "Display files". Flight modes, Error flags, GPS accuracy and RC signal strength (fsk_rssi) are indicated by different colors. Maximum values for speed (tas) and altitude will be marked as yellow to find those highlights faster.

### 2.3.1 Telemetry, Remote, RemoteGPS

| Date/time | fsk_rs: | voltage | current | altitude | latitude | longitude | tas | gps_used | fix_type | satellites_num | roll | yaw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20170930 16:41:38:094 | -41 | 12.4 | 0.0 | -0.43 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.42 | 90.609 |
| 20170930 16:41:40:931 | -29 | 12.4 | 0.0 | -0.28 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.43 | 60.78 |
| 20170930 16:41:42:912 | -16 | 12.4 | 0.0 | -0.24 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.42 | 59.58 |
| 20170930 16:41:43:491 | -22 | 12.4 | 0.0 | -0.28 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.41 | 59.7 |
| 20170930 16:41:44:775 | -23 | 12.4 | 0.0 | -0.35 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.41 | 59.940 |
| 20170930 16:41:45:573 | -30 | 12.4 | 0.0 | -0.4 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.41 | 59.97 |
| 20170930 16:41:46:351 | -33 | 12.4 | 0.0 | -0.32 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.41 | 60.23 |
| 20170930 16:41:46:459 | -23 | 12.4 | 0.0 | -0.33 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.41 | 60.25 |
| 20170930 16:41:46:647 | -21 | 12.4 | 0.0 | -0.33 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.27 |
| 20170930 16:41:47:136 | -25 | 12.4 | 0.0 | -0.31 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.29 |
| 20170930 16:41:47:244 | -22 | 12.4 | 0.0 | -0.32 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.29 |
| 20170930 16:41:47:738 | -19 | 12.4 | 0.0 | -0.32 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.379 |
| 20170930 16:41:47:926 | -23 | 12.4 | 0.0 | -0.32 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.35 |
| 20170930 16:41:48:426 | -26 | 12.4 | 0.0 | -0.31 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.39 | 60.16 |
| 20170930 16:41:48:520 | -24 | 12.4 | 0.0 | -0.29 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.39 | 60.190 |
| 20170930 16:41:48:906 | -30 | 12.4 | 0.0 | -0.3 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.39 | 60.34 |
| 20170930 16:41:49:107 | -23 | 12.4 | 0.0 | -0.3 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.39 | 60.36 |
| 20170930 16:41:49:597 | -25 | 12.4 | 0.0 | -0.28 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.379 |
| 20170930 16:41:49:990 | -27 | 12.4 | 0.0 | -0.31 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.4 |
| 20170930 16:41:50:185 | -31 | 12.4 | 0.0 | -0.31 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.41 |
| 20170930 16:41:50:389 | -24 | 12.4 | 0.0 | -0.3 | 0.0 | 0.0 | 0.0 | false | 0 | 0 | 0.4 | 60.42 |
| 20170930 16:41:51:472 | -33 | 12.4 | 0.0 | -0.36 | 0.0 | 0.0 | 0.05385165 | false | 3 | 7 | 0.39 | 60.48 |

With "Source" (Telemetry, RemoteGPS, Remote or Sensor) you can select what file from the FlightLog shall be displayed (if file is available).

Sensor files of Typhoon H Plus (*.txt) are no more related to Telemetry file numbers and can only opened by menu item "Open Sensor file from YTH+...".

Example: Remote_xxxxx.csv



By click on right mouse button, you will get a context menu for following functions:

- Show at Google Maps: GPS coordinates of the selected data set will be shown at Google Maps in Hybrid View.
- Show at OpenStreetMap: GPS coordinates of the selected data set will be shown at OpenStreetMap.
- Data analysis: As at Elevation histogram this performs an analysis for a predefined number of data sets, results are in status bar.
- Go to data point: Scrolls down the table to the selected data set. The selection may come from Elevation histogram if the cursor is switched on.
- Go to error flags: Scrolls down to the next error flags in the table.
- Reset start/end: Deletes saved start and end time stamps for cutting FlightLog files.
- Set start: Sets a beginning time point where cutting of files starts.
- Set end: Sets the end time point where cut out of data sets will be finished.
- Cut files: Creates a new set of FlightLog files limited by start and end point.

**Keyboard shortcuts:**

| | |
|---|---|
| Ctrl + c | Copy selected cells to clipboard |
| Ctrl + b | Set begin point to cut files or measure time intervals |
| Ctrl + e | Set end point to cut files or measure time intervals |
| Ctrl + n | Cut files and create new FlightLog limited by start and end point |
| Ctrl + f | Start or continue search (see chapter "Find" below) |
| Ctrl + s | Filter data table by search value (same functionality as "Find") |
| F3 | Start or continue search (see chapter "Find" below) |
| F4 | Filter data table by search value (same functionality as "Find") |
| F5 | Reset filter, renew data table |
| Escape | Reset filter, renew data table |

Double click on a cell shows additional information in the status bar below (explains flight modes, motor status and so on). The same information will appear as hint if you hold the mouse pointer on a cell.

In column Date/Time cells will be marked with color, if the interval between the time stamps is bigger than expected. This may be normal, but it indicates possibly bad radio conditions or high processor load in flight controller. Good to have an eye on it...

> Threshold 1: salmon - 600 ms
> Threshold 2: red - 2 sec
> For Yuneec Breeze and RemoteGPS the thresholds are: 1..2sec, 2..5sec

**Additional detailed view:**

For Telemetry, Remote or RemoteGPS, a click on the header of a column opens another window with statistics or charts. This makes it easier to identify and understand what values there are and how things go in the raw data files.
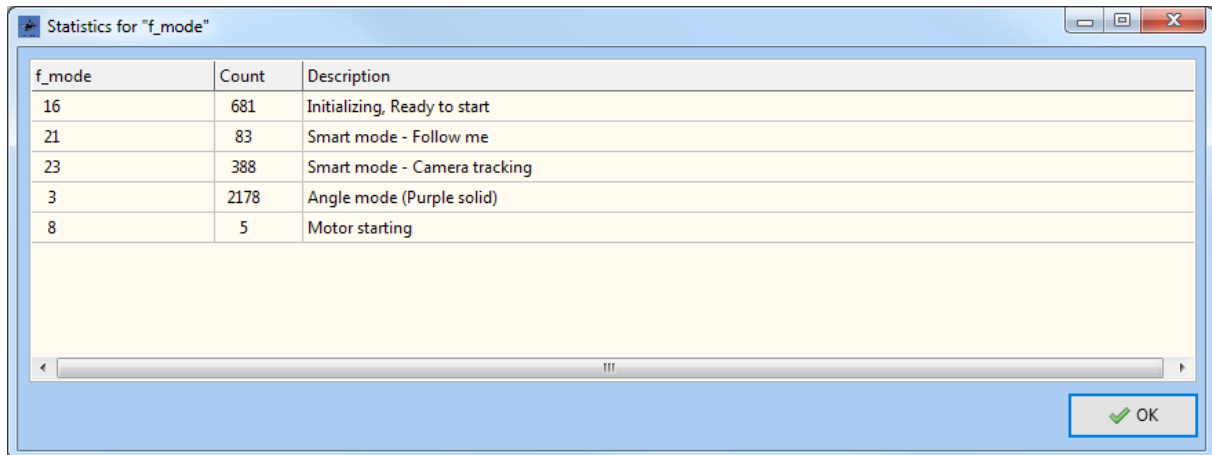
Example:
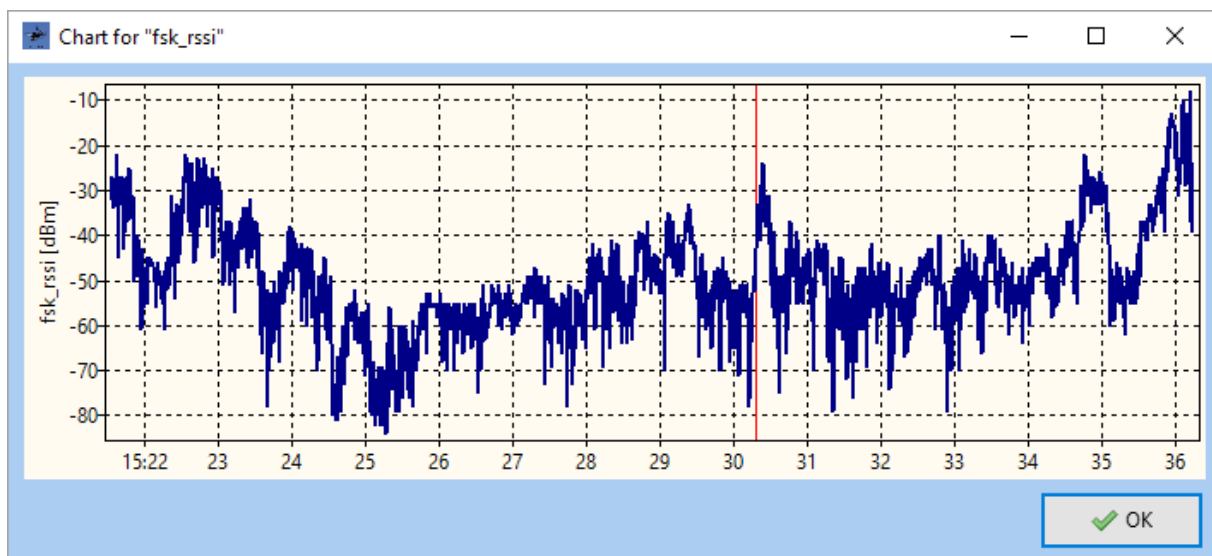


If header of columns with coordinates was clicked, then the chart shows the distance from home point.
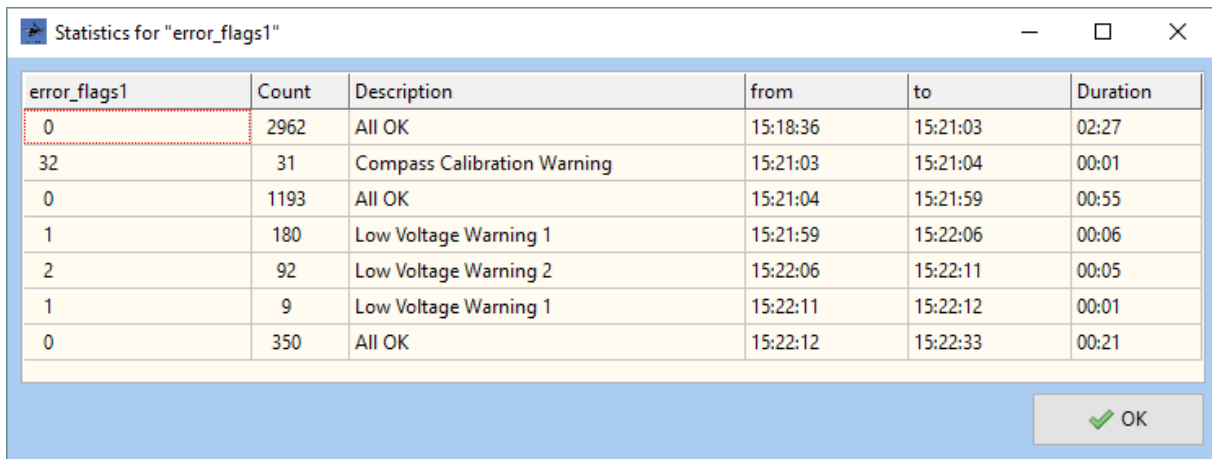
You will see a vertical red line as cursor for the cell that you have clicked in the table of raw data on the position in the timeline of the chart.

Or for countable values as simple statistics:

**Statistics for "f_mode"**

| f_mode | Count | Description |
|--------|-------|-------------|
| 16 | 681 | Initializing, Ready to start |
| 21 | 83 | Smart mode - Follow me |
| 23 | 388 | Smart mode - Camera tracking |
| 3 | 2178 | Angle mode (Purple solid) |
| 8 | 5 | Motor starting |

OK

If it makes sense the statistics came up as detailed statistics in timely order:

**Statistics for "error_flags1"**

| error_flags1 | Count | Description | from | to | Duration |
|--------------|-------|-------------|------|-----|----------|
| 0 | 2962 | All OK | 15:18:36 | 15:21:03 | 02:27 |
| 32 | 31 | Compass Calibration Warning | 15:21:03 | 15:21:04 | 00:01 |
| 0 | 1193 | All OK | 15:21:04 | 15:21:59 | 00:55 |
| 1 | 180 | Low Voltage Warning 1 | 15:21:59 | 15:22:06 | 00:06 |
| 2 | 92 | Low Voltage Warning 2 | 15:22:06 | 15:22:11 | 00:05 |
| 1 | 9 | Low Voltage Warning 1 | 15:22:11 | 15:22:12 | 00:01 |
| 0 | 350 | All OK | 15:22:12 | 15:22:33 | 00:21 |

OK

A double click on a line of this detailed statistics let you jump to the related data block in the data table. For error flags, this is a faster and better way to navigate compared to context menu „Go to error flags".

### 2.3.2 Sensor files

Sensor file contains a binary byte stream. Each dataset consists of header and payload. The dataset header (light green) is shown as decimal number, the payload (PL1..n) is displayed as hexadecimal bytes but without 2 byte checksum (CCITT X25 CRC16).

If you hold the mouse pointer on a cell the value will be displayed as decimal and character set too.

**Show Sensor data from Typhoon H:**

| SeqNc | SysID | CompID | TargetID | TgtSubID | MsgID | lenPL | PL1 | PL2 | PL3 | PL4 | PL5 | PL6 | PL7 | PL8 | PL9 | PL10 | PL11 | PL12 | PL13 | PL14 | PL15 | PL16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 01 | 01 | 1B | CA | CE | 24 | E7 | 05 | 00 | 00 | 00 | 00 | FE | FF | C3 | FF | FD | FB | 00 | 00 | FE | FF |
| 01 | 01 | 01 | 1D | 05 | 83 | 12 | 01 | 00 | B2 | 13 | 76 | 44 | 66 | 66 | E6 | 3B | 2B | 11 | | | | |
| 02 | 01 | 01 | AC | 09 | 60 | 96 | AA | C3 | 28 | 42 | DD | 3F | 84 | 42 | 0F | 83 | 17 | 40 | 57 | E8 | B0 | 3A |
| 03 | 01 | 01 | 1E | 0A | 83 | 26 | 01 | 00 | 34 | 61 | 22 | 3D | B2 | 21 | CE | 3B | F4 | 7C | A0 | 3F | AC | F9 |

RecordID:        **$BC**
Header length:   8 Byte
Payload length:  0 to minimum 96 bytes (the longest record I have seen up to now)

| Byte no | Meaning | Values | Status |
|---|---|---|---|
| 0 | Record ID | $BC (= decimal: 188) | checked |
| 1 | Length Payload | 0 to n | checked |
| 2 | Sequence Number | 0 to 255, starts again with 0 | checked |
| 3 | Target ID | undocumented/unknown | supposed |
| 4 | Target Sub ID | undocumented/unknown | supposed |
| 5 | Message ID | undocumented/unknown | supposed |
| 6 | Payload 1 (possibly Payload Data Type) | undocumented/unknown | supposed |
| ... | Payload n | undocumented/unknown | ... |
| n-1 | CRC16 (CCITT X25) | CRC16 with Header and Payload but without Record ID | checked |
| n | CRC16 (CCITT X25) | CRC16 with Header and Payload but without Record ID | checked |

 Due to missing documentation by Yuneec, no interpretation of those datasets is available.

**Show sensor files from Typhoon H Plus and Mantis Q:**

The concept of sensor data for Typhoon H Plus has changed, format too. The file name numbers of sensor files cannot assigned to the other files in FlightLog. Thus, sensor data only can be opened and displayed as single file by menu item "**Open Sensor file from PX4...**" in main menu.

There are big gaps in Sequence numbers, means there are messages missing, not recorded in sensor file.
Mantis Q has all records in consecutive order.

Yuneec **Mantis Q** has only Sensor files as FlightLog, but in the same format as Typhoon H Plus (both PX4). Overview table remains empty. Only the file numbers will be displayed.

| Fix1 | Fix2 | SeqNc | SysID | CompID | MsgID | MsgID | MsgID | MsgName | lenPL | Fix9 | Fix10 | Fix11 | Fix12 | Fix13 | Fix14 | Fix15 | Fix16 | Fix17 | Fix18 | PL1 | PL2 | PL3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 00 | 06 | 01 | 01 | 00 | 00 | 00 | heartbeat | 9 | 00 | 00 | 03 | 00 | 0D | 0C | 59 | 03 | 03 | CC | 96 | 2F | 1E |
| 00 | 00 | 40 | 01 | 01 | 21 | 00 | 00 | global_position_int | 28 | FD | 83 | 01 | 00 | 4D | 8B | FD | 1B | DA | 4F | 14 | 05 | 40 |
| 00 | 00 | 42 | 01 | 01 | 20 | 00 | 00 | local_position_ned | 28 | 01 | 84 | 01 | 00 | 64 | 5D | 14 | 40 | 94 | 2C | 1F | 3F | DC |
| 00 | 00 | 43 | 01 | 01 | 1E | 00 | 00 | attitude | 28 | 05 | 84 | 01 | 00 | 14 | 50 | 25 | BD | 23 | E0 | 23 | BD | DB |
| 00 | 00 | 47 | 01 | 01 | F5 | 00 | 00 | extended_sys_state | 2 | 00 | 01 | 97 | E6 | B2 | 1E | 02 | 08 | 64 | 01 | 00 | 00 | |
| 00 | 00 | 48 | 01 | 01 | 41 | 00 | 00 | rc_channels | 42 | 13 | 84 | 01 | 00 | DC | 05 | DC | 05 | DC | 05 | DC | 05 | DC |
| 00 | 00 | 4D | 01 | 01 | 18 | 00 | 00 | gps_raw_int | 49 | B2 | 2A | EC | 05 | 00 | 00 | 00 | 00 | 4A | 8B | FD | 1B | DC |

| Byte no | Meaning | Values | Status |
|---|---|---|---|
| 0 | Record ID | $FD (= decimal: 253) | checked |
| 1 | length Payload | 0 to n | checked |
| 2 | Fix1 | always zero | |
| 3 | Fix2 | always zero | |
| 4 | Sequence number | 0 to 255, after 255 starts with zero again | checked |
| 5 | System ID | MAV Link System ID 1 (always 1) | checked |
| 6 | Component ID | 1-Autopilot1; 100-Camera; 154-Gimbal | checked |
| 7..9 | Message ID (3 byte) | MAV link messages common | supposed |
| 10..19 | Fix9 bis Fix18 | Payload (part 1) | |
| 20 | Payload 1 | Payload part 2; first variable byte | |
| ... | Payload n | Payload following variable bytes | ... |
| n-1 | CRC16 (CCITT X25) | CRC16 with Header and Payload; without Record ID; always zero | checked |
| n | CRC16 (CCITT X25) | CRC16 with Header and Payload; without Record ID; always zero | checked |

For problem analysis following MAV Messages will be checked:

| | |
|---|---|
| HEARTBEAT | MAV_MODE_FLAG and MAV_STATE |
| | PX4 and Quad copter: interpreted as Mantis Q. |
| SYS_STATUS | onboard_control_sensors_present, |
| | onboard_control_sensors_enabled, |
| | onboard_control_sensors_health, |
| | SW Load, Voltage and Current (for Mantis Q always zero) |
| GPS_RAW_INT | Time since boot and coordinates as GoogleMaps Link |
| EXTENDED_SYS_STATE | MAV_LANDED_STATE |
| STATUSTEXT | Severity and text |

The results are listed as **text in AppLog**.

If option "Flight path from PX4 sensor" is set, KML/KMZ or GPX files will be created and stored in the same directory as the sensor files.
This works also for sensor files from Typhoon H Plus and *.tlog files from H520.

For more information regarding PX4 sensor files see:
https://developer.yuneec.com/documentation/125/Supported-mavlink-messages

## 2.4    Find/Select

Use Find to search in whole columns of display file tables for a value. Depending on size of values the whole search string will be used or, if values are larger than 4 characters (i.e. Date/Time) or contains a dot, it is enough that a part of the value match the search string. Select the column to find in by click on a cell of the table. Search is only possible if a search string was entered and a column was selected. To search hit F3 or Ctrl+F. Find is never case sensitive.
This functionality can also be used for Scanning (see chapter "Search problem case").

With same functionality, it is possible to select only matching data (filter the table) by F4 or Ctrl + s. F5 or change file brings you back to whole table (reset filter).

With left mouse button and Ctrl key you can take over values from the table to the search field.
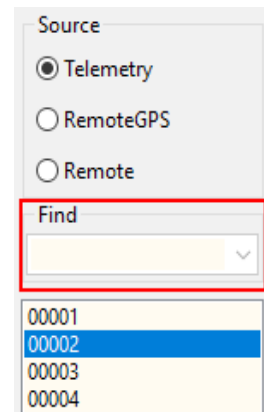
## 2.5    Archive

The ST10 saves only 20 flights and deletes older ones. Once deleted it cannot recovered any more. That is why I pull from time to time the FlightLog data from the memory card located in the ST10 and delete the whole directory there. It will be automatically recreated during next flight by the ST10 SW. Because the directory name is then always the same, I rename it to put it into the archive on the PC. This can be done by the button Archive to avoid overwriting older files with newer ones with the same name. This function adds simply a time stamp at the end of the directory name. The format of the directory suffix depends on settings for archiving.

## 2.6 Convert data

- **KML/KMZ**
  First intention of this application was to convert flight log data to KML files for Google Earth. For larger files Google recommends the format KMZ, which is nothing else than a zipped KML file. The output format can be defined in settings. KML/KMZ files can also be created from PX4 sensor files.

- **GPX**
  Another supported file format is the GPX-format ([GPS Exchange Format](#)). This file format can be used to visualize your flight in services like [Doarama](#). GPX files can also be created from PX4 sensor files.

- **dashw.csv**
  Additionally, it is now possible to create output files for [DashWare](#) (due to missing profile, this function is not available for Yuneec Breeze). The format is the same as "st2dash" from Tami: [http://www.drohnen-forum.de/index.php/Thread/12303-ST2Dash-der-Flightlog-Konverter-f%C3%BCr-die-ST10-Q500/](http://www.drohnen-forum.de/index.php/Thread/12303-ST2Dash-der-Flightlog-Konverter-f%C3%BCr-die-ST10-Q500/)
  There you can find the related DashWare profile for the Q500 "Yuneec Q500 DashWare Profile v1.5". There will be converted only data from real flight modes. Calibration and initialization data will be suppressed. This may be then easier to synchronize it with the video.

- **rr.csv**
  There is also an experimental output format for [RaceRender](#) but without a working profile.

- **CCC Waypoints**
  You can convert telemetry to CCC waypoint files for Typhoon H.

  Remark: **Use CCC Waypoints on your own risk.**


Set the output format in "Settings" > "Data conversion". The status bar on the bottom shows the selected output format. The results are saved in the FlightLog directory. To open file manager at this directory, double click on the address field "FlightLog".

If set, also the movement of the pilot (or better of the ground station) can be added to KML/KMZ files (as black line). GPS data from RemoteGPS are used for this.


It's possible to replay KML/KMZ files by using navigation and settings of GoogleEarth:
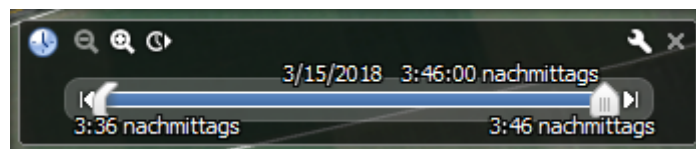
## 2.7    Elevation histogram

This page shows the elevation histogram with different colors depending on flight mode and a curve for the battery voltage of the copter.
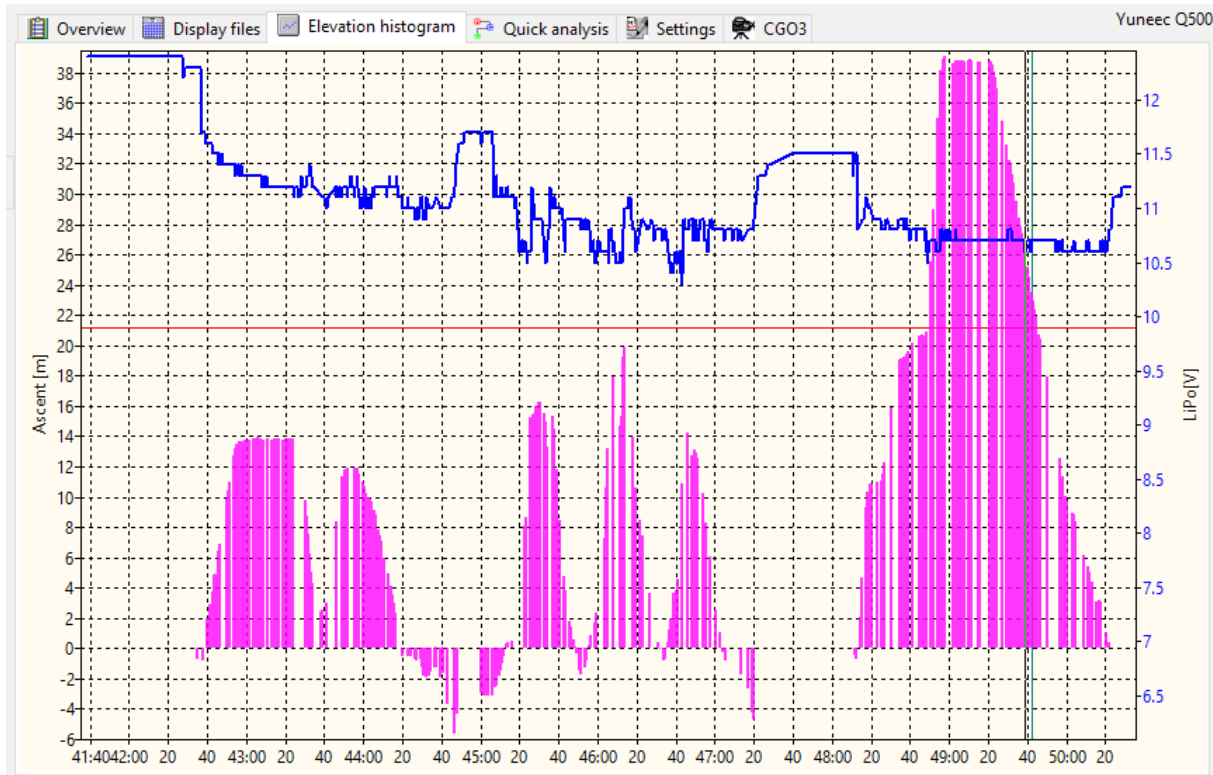


The elevation histogram is a bar chart with a bar for each data set, which has a color depending on the flight mode (f_mode):

- green:        Smart mode (6, 21, 23),
- purple:       Angle mode (3, 4),
- orange:       without GPS support (2, 5, 7, 22, 24),
- blue:         Stability mode (0, 1),
- red:          RTH and Agility mode (13, 14, 20),
- maroon:       Error, Calibrations (9, 10, 11, 12, 17, 18).

Because there are different time intervals between the telemetry data sets sent by copter, there may be gaps in the histogram between the bars.

As overlay, there is a curve for the voltage of the flight battery. The color of the curve has different meanings:

- blue:         real flight with GPS support,
- red:          real flight with GPS switched off,
- gray:         flight by simulator UAV-Pilot (identified by values in column 'current').

Context menu, called by right mouse button:

- Copy to clipboard: Copy the picture of the elevation histogram to clipboard as bitmap.
- Save as picture...: The elevation histogram will be saved as *.png file.
- Cursor on/off: Switches on/off a vertical line following the mouse pointer as cursor to navigate in the diagram. With the cursor, you can select a data set as start for analysis.
- Go to table: Opens the table with raw data and jumps to the selected data set.
- Reset start/end: Deletes saved start and end time stamps for cutting FlightLog files.

**Keyboard shortcuts:**

Ctrl + c         Copy elevation histogram to clipboard

Ctrl + '+'       Increment number of data sets for analysis

Ctrl + '-'       Decrement number of data sets for analysis

Ctrl + n         Cut files and create new FlightLog limited by start and end point

Escape           Cursor off

**Not working for Mantis Q.**


## 2.8    Data analysis

The analysis functionality is available at tables in "Display files" and at "Elevation histogram". The results will be displayed in the status bar at the bottom of the application window.

Analysis at elevation histogram: Set the cursor to 'on' in context menu (activated by right mouse button) and navigate to desired data set. Start analysis by click on left mouse button. Results will be displayed in status bar at the bottom. If the CTRL-key is down when the left mouse button was clicked, then the results will be copied to clipboard too. The selected data set will be taken over to the "Data point" field in the header of the application. This is then the start of the interval of data sets defined in settings. This point can also be used as start point for analysis in table view (Display files). Following results will be shown:
- time interval depending on number of data sets for analysis defined in settings,
- average climbing or sinking rate if delta in altitude is > 2m inside the interval,
- distance between start and end point of the data interval,
- length of trip covered by data interval,
- average speed in the data interval.

Data analysis for 3.8s: ascend 4.87m/s, Distance 0.0m, Length of trip 0.1m, Speed 0.04m/s


Analyse at data table: Start analysis by context menu with right mouse button. Start point is the selected data set in field "Data point". It can be set / changed by click on a cell in the table. The data interval depends on settings (the same as for analysis in elevation histogram).

Output for telemetry data (Copter) is the same as described at Analysis at elevation histogram.

Analysis of ST10 data (GPS of the ground station) gets the following results:
- time interval depending on number of data sets for analysis defined in settings,
- average altitude over reference ellipsiod from GPS data,
- length of trip of the ground station covered by data interval,
- average speed of the ground station in the data interval.

Data analysis for 41.0s: Altitude 143.0m, Length of trip 18.3m, Speed 0.45m/s

Analysis of RC connection data (Radio) gets following results:
- time interval depending on number of data sets for analysis defined in settings,
- position of the flight mode switch,
- position/movement of the sticks – minimum, maximum position in the time interval.

Data analysis for 7.1s: Angle mode  Ch1 - J1 (thr): min=-1%/max=+7%  Ch2 - J4 (roll/ail): min=-20%/max=+3%  Ch3 - J3 (pitch/ele):


In the Elevation histogram it's possible to increase the number of data sets for analysis by CTRL and + or decrease by CTRL and - key.

Also, a double click on the status-bar will copy the results of the analysis to the clipboard.

## 2.9 Quick analysis

To have a quick overview three freely selectable histograms will be displayed on the same tab sheet.
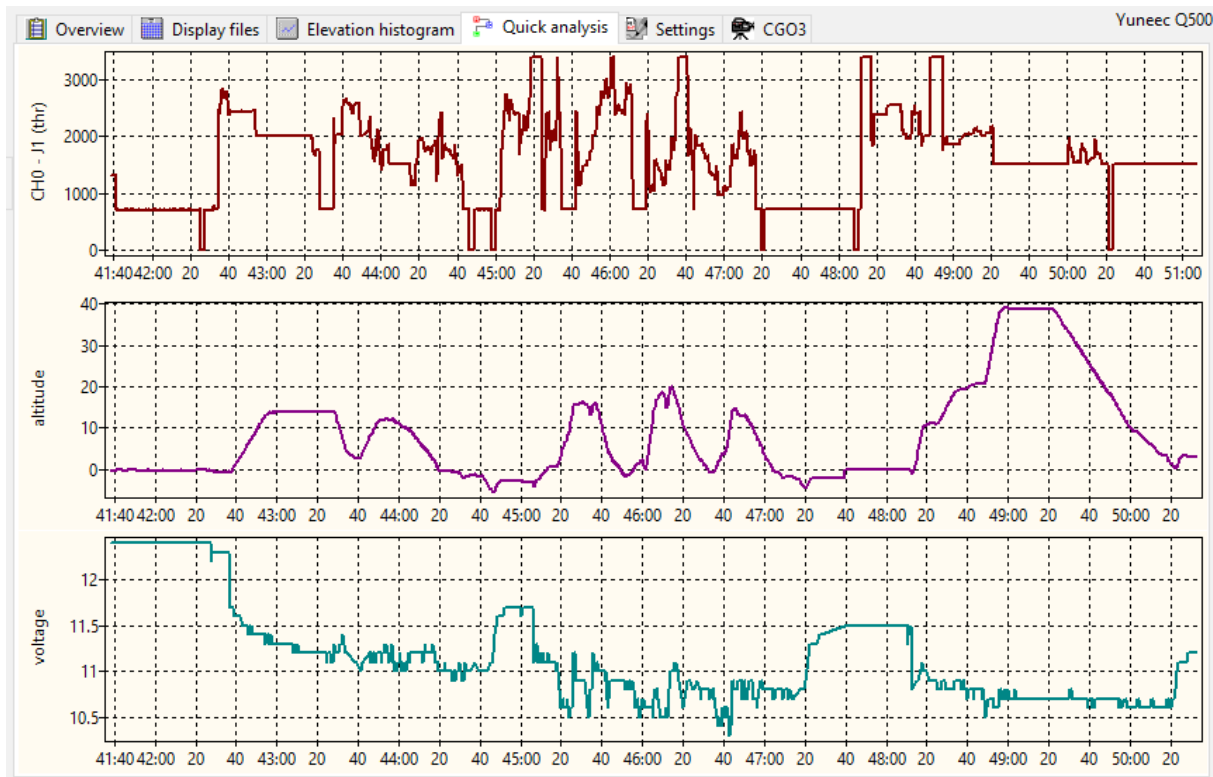


You can select data columns from all three files of a FlightLog (also mixed from different files like Telemetry, Remote or RemoteGPS) or use one of the predefined profiles. If mixed column selection will be used then it is a good idea to cut the files before in order to get same begin and end time stamps in all tree files.
The selection can be done on tab sheet "Settings/Data analysis" (see Settings).
Boolean values will be converted to numbers for histograms:
- true: +1
- false: -1

Among others with this function you can compare stick input with results in the telemetry (i.e. CH2 + tas + pitch). But also, all other combinations are possible, if useful or not.
Additionally, you can show a fourth histogram in another move-able window by double click on the header of the table (as described above). This is by the way the only possibility to convert and display the coordinates (longitude, latitude) into distance from start. This is not possible in Quick analysis histograms due to runtime problems.

Context menu, called by right mouse button:
- Settings: Go to Settings > Data analysis to make your own assignments between freely selected data columns to the three histograms of Quick analysis.
- Default: Reset assignments to default values.
- Profiles: Available profiles are listed in a sub-menu for faster execution of frequently used data combinations.
- Show all profiles: Show all profiles as slide show (duration 3s) for fast overview.

**Not working for Mantis Q.**

## 2.10   Scanning

Scanning means to search through a whole directory tree. This is useful for two different functions: Flight Record and Search problem cases in a large set of FlightLogs.



The selection field for the directory in use is common for both functions. As for the other directory edit fields, a double click opens this directory in the file manager. Previous used directories will be listed in the drop-down list.

**Not working for Mantis Q and only partially for Typhoon H Plus (flight time incorrect).**

**Keyboard shortcuts:**
Ctrl+c ---- Copy table of results to clipboard

### 2.10.1   Flight record

If you have discipline to save your own flight logs for each copter in a separate directory, you can generate a flight record file (in text or CSV format). Select the root directory for the flight logs and click on button Flight record. CSV files can be used in charts or databases.

Entries in the Copter-ID will be taken over to the header of the flight record. There is a list that will be filled from edit field "Saved models" in Settings.
The table of results shows number and overview (time or location) of the recorded flights.

Format flight record: Select output format as text or as CSV file (output in columns).

Simulator: If checked, the flight times with simulator (UAV Pilot) will be added to the total time in the flight record. (default: yes).

**Not working for Mantis Q.**

### 2.10.2 Search problem case

This function was made to find problematic cases in a large collection of FlightLogs. The selected directory will be recursive scanned for FlightLog that match predefined rules.
Following rules are available:

- **Emergency:** List FlightLogs with crashes (occurrence of flight mode 12).
- **Compass warnings:** List FlightLogs with more than ten consecutive Compass Calibration Warning flags.
- **Compass warnings (>5sec):** List FlightLogs with more five seconds consecutive Compass Calibration Warning flags. This should be alerted at the remote control unit by error message.
- **Voltage warning 2:** List FlightLogs with more than two Voltage Warnings 2.
- **Voltage:** List FlightLogs where voltage undercut the value in search field.
- **Stick calibration:** List FlightLogs where less than 5% of datasets in Remote have neutral position (2048). This may be an indicator of missing stick calibration.
- **TeamMode:** Search for Gimbal Pan Mode at control by right stick (1433.0).
- **Edit/Find:** List FlightLogs according the find/search rules described in chapter "Find/Select". This is more flexible and aimed to find special cases.
- **Sensor_xxxxx.bin:** Find FlightLogs where Sensor file is available.
- **Sensor+FW:** Find FlightLogs where firmware issue is available in Sensor file.

To filter the results for vehicle type the check box "Vehicle Type" must be checked.

The path to FlightLogs that match the rules will be listed in the table of results. By double click on the row the related FlightLog will be loaded and displayed.

**Not useful for Mantis Q.**

## 2.11 CGO3 control

This is for testing commands to CGO3 and a raw interface to control the camera. Of course, this is only possible if a WLAN connection on 5GHz is established. The default password for CGO3 WLAN is **1234567890**. To get connection, a SD card must be in the camera because the password is saved there in a file "MISC\wireless.conf". The traffic light shows the status of the WLAN connection if the Status button was clicked.
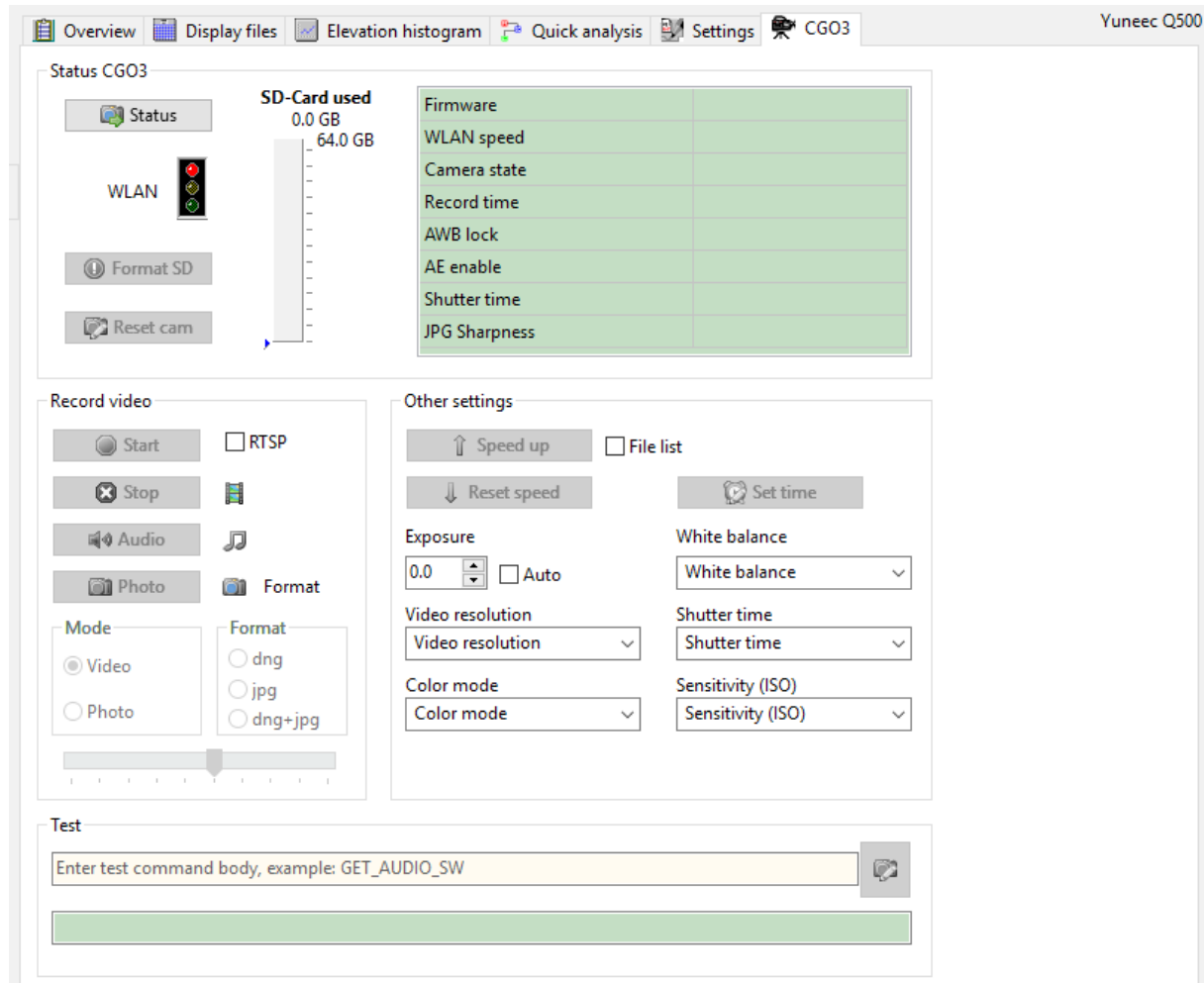


Status CGO3: Status will initialize the camera and starts a query to get status of the CGO3. Some results are in the table on the right side. Status query needs to be done first to enable the functions.

Format SD is doing a formatting of the SD card in the CGO3. It deletes all files and recreates the needed directories. Also, a new configuration file will be created with standard password for WLAN connection (1234567890).
Reset cam resets all settings of the CGO3 to factory default values.

Record video: Start / Stop controls video recording. If 'RTSP' is checked the command 'rtsp://192.168.42.1/live' will be sent to local browser. The internet browser must be able to play the RTSP stream. The protocol RSTP must be registered in the browser to make this happen (best is to redirect to VLC player).

Audio: With Audio button, you can toggle between Audio on and off.

Photo: Take a shot with Photo button.

Mode: You can switch between video and photo mode of the camera. For photo, it is recommended to switch to photo mode. Take a photo in video mode results in bad quality and only jpg.
Format: Select output format of the pictures: .dng is raw format, .jpg is compressed format. With the slider below, the sharpness for picture post processing to jpg format can be set between 1 and 10 (default is 6).

Other settings: To increase the WLAN speed to 56MBit, use Speed up. This useful if you want to download or check pictures from the CGO3. Large videos take too long to download via WLAN. If 'File list' is checked then the file system in browser will be opened, offer the possibility to browse and download files from SD card. After those action, it is recommended to set the default WLAN speed by Reset speed. This will set the WLAN speed to default 6MBit.
Set time: This will send a command to the camera to set camera internal time to current time.

If exposure is set to automatic (check box 'Auto' checked), then the exposure can be corrected from -2.0 to +2.0 in 0.5 steps.
If exposure is set to manual, then it is possible to select ISO sensitivity and shutter time using related drop down boxes.
You can also select video resolution from full HD, 2K up to 4K, the white balance and color mode (color mode only for jpg pictures).


Test: Test environment for commands to CGO3, CGO3+ or CGO-ET. Enter only the body of the command (i.e. 'GET_PHOTO_FORMAT'). Prefix 'http://192.168.42.1/cgi-bin/cgi?CMD=' will be automatically added. Below is the field for the return value. "rval":0 means, command checked and executed successful. By double click on this output field, the return value will be copied to the clipboard.
The description of the commands is here:
https://github.com/racerxdl/CGO/blob/master/Docs/commands.md

## 2.12   Settings

On tab sheet "Settings" it is possible to commission different parameter to define how the application works. Settings will be saved in an XML file related to the application.

Settings are separated to following tab sheets:
- Data conversions
- Data analysis
- Other settings

### 2.12.1   Data conversions

All settings for data conversions and like output format and how it will be displayed in GoogleEarth.
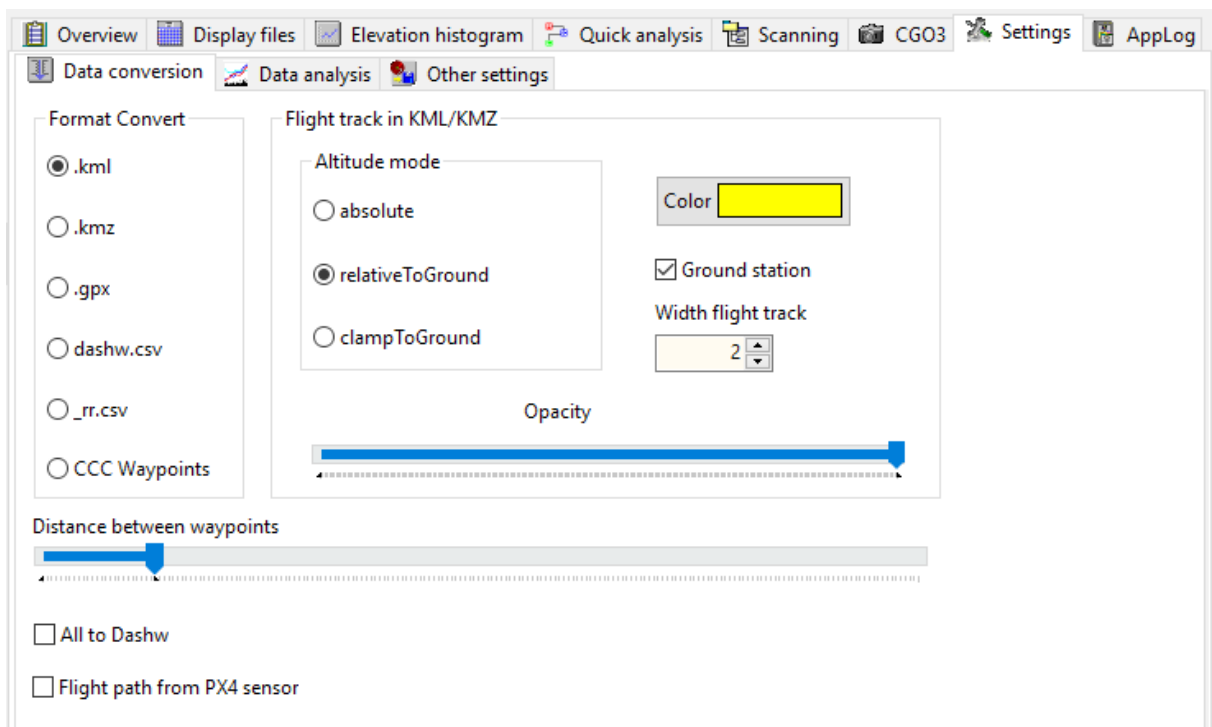


- Format - .kml ---> ⬚Convert⬚ creates for each flight a *.kml file, which can be imported to Google Earth and many other map services. The file can be read and edited by any text editor
- Format - .kmz ---> same as *.kml, but zipped.
- Format - .gpx ---> ⬚Convert⬚ creates for each flight a *.gpx file, which can be imported to many map services or applications like Doarama. The file can be read and edited by any text editor
- Format - dashw.csv ---> ⬚Convert⬚ creates *.csv files for DashWare import.
- Format - _rr.csv --> ⬚Convert⬚ creates *.csv files for RaceRender import (experimental, no profile available).
- Format - CCC waypoints ---> ⬚Convert⬚ telemetry to CCC waypoint files.

Remark: **Use CCC Waypoints on your own risk.**

Flight track in KML/KMZ - Color ---> Set colour for the flight track in Google Earth.
Flight track in KML/KMZ - Opacity ---> Set opacity for the flight track in Google Earth. Right is full opacity (=default).
Flight track in KML/KMZ - Width ---> Set width for the flight track in Google Earth (default 3).

Altitude mode:
- absolute: Height above sea level computed from altitude of telemetry plus altitude from GPS-data of the STxx at start point. No distortion of the flight path, but depending on accuracy of the GPS-data of the STxx and the accuracy of the map data, the flight path may be over the ground or parts of it under the ground (invisible on map).
- relativeToGround: Only altitude from telemetry. Good for flat terrain, but distortion of flight path over hilly ground.
- clampToGround: Flight path will be projected to the ground, no height displayed. It's good to find flown-away copters.

Ground station: If checked the movements of the ground station (pilot) will be added to KML/KMZ flight path.

Example (relativeToGround):
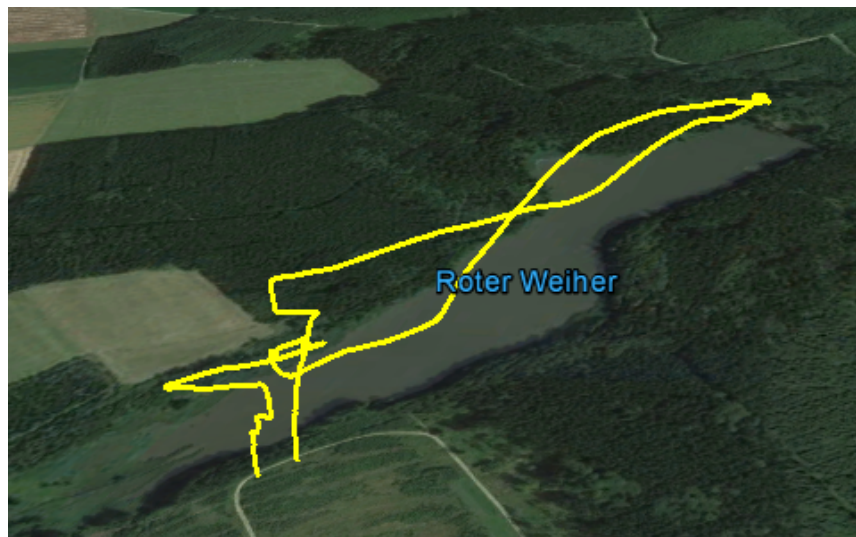


All to Dashw → Export all data to DashWare (initialization, calibration, no GPS), not only from real flight modes (default: no).

Flight path from PX4 sensor → If checked a KML/KMZ or GPX file depending on format settings will be created during display of PX4 sensor files. Those files will be stored in the same directory as the sensor files.
This works also for *.tlog files from H520.

### 2.12.2  Data analysis

Settings for data analysis in table or elevation histogram.



Elevation histogram: Settings for the analysis function by cursor (cursor on) in elevation histogram.

Number of data sets for analysis ---> set how many data sets (data interval) beginning with the selected start point will be checked.
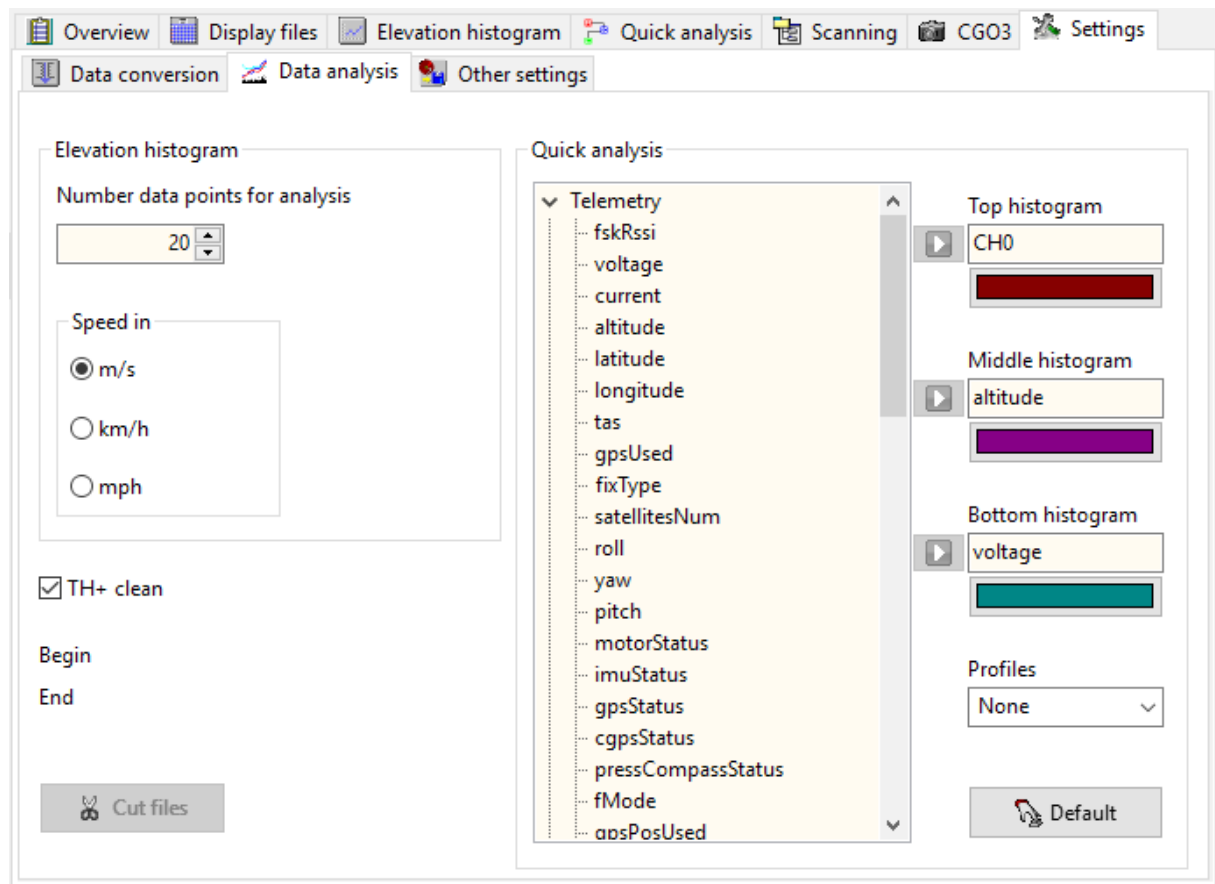
Speed in - converts speed values in Overview and Analysis
- m/s ---> Speed (vertical and horizontal) in meter per second (default).
- km/h ---> Speed (vertical and horizontal) in kilometers per hour.
- mph ---> Speed (vertical and horizontal) in miles per hour.

If mph was selected, then also Overview and Flight record have output in mph or ft.

**TH+ clean** ---> Typhoon H Plus sends a lot of unusable telemetry data with senseless values inside. Those will be supressed if TH+ clean is checked (default).

Cut files: If start and end points are set, it is possible with this function to cut data sets between start and end time points and save it to another FlightLog file set. This new FlightLog can be analyzed easier and faster if it contains only the important part of the FlightLog. With this, it is for example possible to exclude the initializing phase.
A double click on the file list on left side re-scans the FlightLog and the new FlightLog set can be selected for analysis.

Quick analysis: Select columns from the FlightLog files for display in the tree histograms at Quick analysis tab sheet and assign colors to the line series. To do this select a column name (marked as

selected in blue) and assign it by blue arrow to one of the three histograms. You have to assign different columns to the three histograms but a mix from different file sets of the same FlightLog (Telemetry, RemoteGPS or Remote) is possible. The list will be created as new for each FlightLog and contains only available values from the data columns.

Example – How to set altitude as top histogram:

1. Select altitude,
2. assign to top histogram by blue arrow – done.
3. Optional: change colour of the line series.

The assignment can also be done by drag&drop.
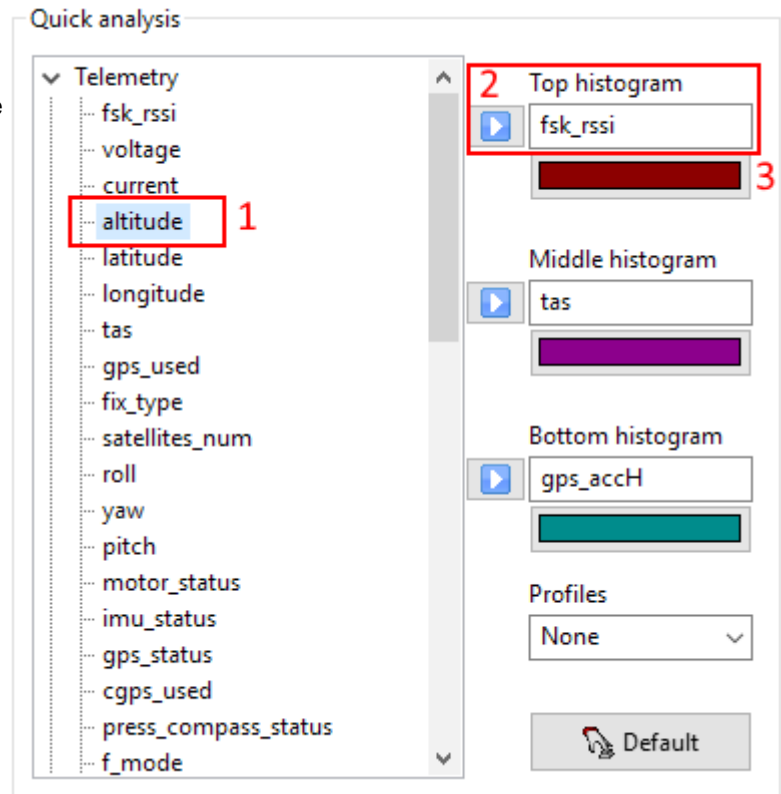


Default: reset column assignment and colors to default values. This is useful if you change between Yuneec Breeze and other Yuneec copters.

### 2.12.3  Other settings

All other settings like behavior of the application.
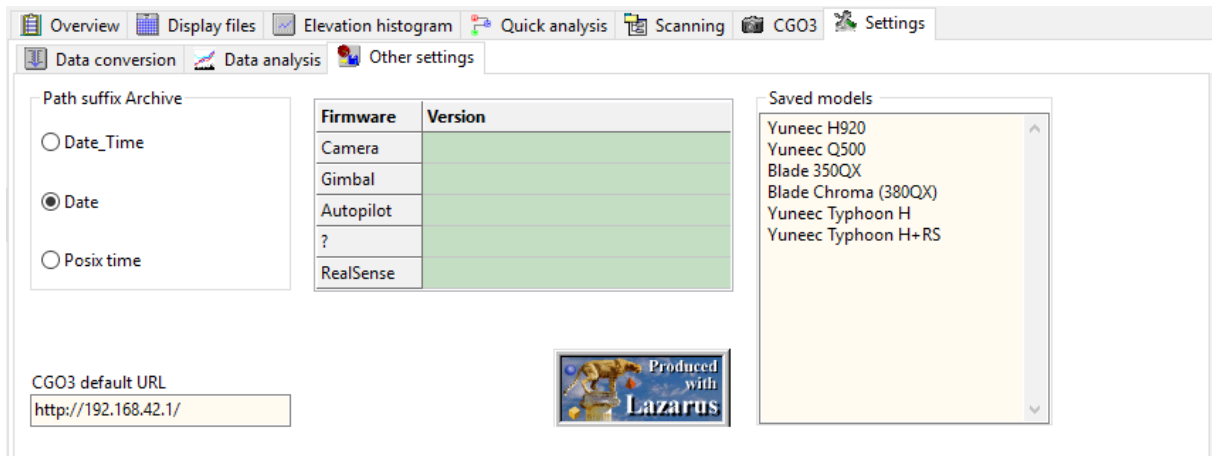


Path suffix: Set the format how the FlightLog directory will be renamed.
- Date_Time ---> the suffix appended after "FlightLog" has the format YYYY-MM-DD_hhmmss.
- Date ---> the suffix appended after "FlightLog" has the format YYYY-MM-DD.
- POSIX time ---> the suffix appended after "FlightLog" is a POSIX time stamp (aka UNIX time – count of seconds since 1.1.1970 00:00h).

Distance between waypoints: Sets the minimal distance between two sets of coordinates of flight path, where a new CCC waypoint will be set during conversion of telemetry to CCC waypoint file.

CGO3 default URL: Enter IP address of the CGO3 with trailing slash (default http://192.168.42.1/). This will be used to send commands to the camera.

Firmware version: Shows the installed firmware versions at the copter from the Sensor files. Firmware versions are not available in all files. Only ST16 has Sensor files in a separate directory. Table remains empty for ST10.
Yuneec Breeze delivers serial number and SW-/Firmware numbers. The serial number can be taken over to "Saved models" and is then available in the list at "Copter-ID" (as well as all other entries in the "Saved models"). This can be selected and will be used as entry in header of the Flight record.
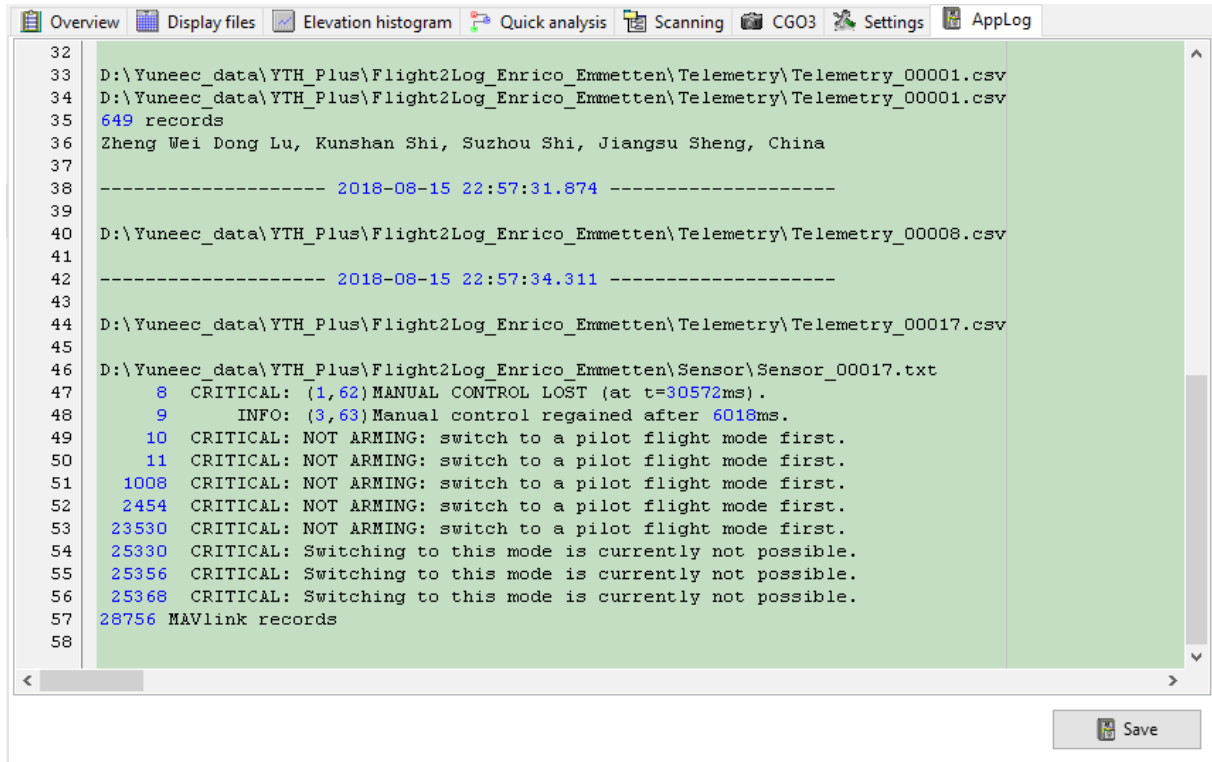

**Keyboard shortcuts:**
Ctrl+c ---- Copy table to clipboard


Saved models: This is a string list for different aircraft that deliver telemetry data. From this list, the related aircraft can be selected for "Copter-ID" to have the right one in the reports for documentation.

## 2.13 AppLog

This page contains a protocol of actions, messages and error indications. This allows to follow the action done and list messages that are already gone.



If sensor files from Typhoon H Plus were opened by main menu item "**Open Sensor file from PX4…**", or FlyLog files from Mantis Q are displayed, those files may contain text messages (MAV-Link message "statustext", MsgID=$FD). Those text messages with severity will be stored in AppLog.

Also the results from some other MAV messages will be listes as text in AppLog, mainly status messages and coordinates as GoogleMaps link.

**Save**: Save AppLog protocol to a simple text file.
In case of errors this log file should be saved and added to the error description.

# 3    Appendix

## 3.1    Error Flags (set bit by bit)

| Bit | Error Flag | Value * |
|-----|-----------|---------|
| 7 | ERROR_FLAG_AIRPORT_WARNING | 128 |
| 6 | ERROR_FLAG_FLYAWAY_CHECKER_WARNING | 64 |
| 5 | ERROR_FLAG_COMPASS_CALIBRATION_WARNING | 32 |
| 4 | ERROR_FLAG_TEMPERATURE_WARNING | 16 |
| 3 | ERROR_FLAG_COMPLETE_MOTOR_ESC_FAILURE | 8 |
| 2 | ERROR_FLAG_MOTOR_FAILSAFE_MODE | 4 |
| 1 | ERROR_FLAG_VOLTAGE_WARNING2 | 2 |
| 0 | ERROR_FLAG_VOLTAGE_WARNING1 | 1 |

If error flag 32 is solid longer than 3 sec during flight, then a Compass error message will appear on the ST16.

* Note: If more than one error flag is set, then the sum of value is displayed in the telemetry data (Example: 33 = ERROR_FLAG_COMPASS_CALIBRATION_WARNING and ERROR_FLAG_VOLTAGE_WARNING1).

## 3.2    Vehicle types

| Value | Vehicle Type |
|-------|-------------|
| 1 | 1 = Yuneec H920 |
| 2 | 2 = Yuneec Q500 |
| 3 | 3 = Blade 350QX |
| 4 | 4 = Blade Chroma (380QX) |
| 5 | 5 = Yuneec Typhoon H or H Plus |
| 6 | 6 = Yuneec H920+ (planned but not used) |
| 7 | 7 = Yuneec Typhoon H+ (planned but not used; vehicleType remains 5) |

## 3.3    Status bytes (set bit by bit)

| Bit | Dec | Hex | imu_status | press_compass_status |
|-----|-----|-----|-----------|---------------------|
| 0 | 1 | 1 | IMU | Pressure |
| 1 | 2 | 2 | n/a | |
| 2 | 4 | 4 | Compass2 | Magnetometer/Compass |
| 3 | 8 | 8 | n/a | |
| 4 | 16 | 10 | Sonar | GPS |
| 5 | 32 | 20 | GPS2 | RealSense |
| 6 | 64 | 40 | Controller Compass / cgps0 | Sonar |
| 7 | 128 | 80 | Controller GPS / cgps1 | IPS? Something only YTH has |

## 3.4 Description Raw data (CSV files)

### 3.4.1 Yuneec legacy

| Column header<br>Telemetry (Copter) | Description | Unit | Status |
|---|---|---|---|
| Date / Time | Date / time including milliseconds | JJJJMMTT<br>hh:mm:ss:zzz | checked |
| fsk_rssi | Received Signal Strength Indication from copter's receiver | dBm | supposed |
| voltage | Voltage off light battery | V | checked |
| current | Current of flight battery, if sensor available (not for Q500 or Typhoon H) | dA | supposed for H920 |
| altitude | Ascent relative to start point | m | checked |
| latitude | Latitude - GPS coordinates of copter | decimal degrees | checked |
| longitude | Longitude - GPS coordinates of copter | decimal degrees | checked |
| tas | True Air Speed, Speed of the aircraft, computed from accelerator data. | m/s | checked |
| gps_used | GPS usage (true, false) | boolean | checked |
| fix_type | GPS Fix Type | ? | |
| satellites_num | Number of detected satellites | number | checked |
| roll | Roll (see Wiki Roll-Nick-Gier) | ° | supposed |
| yaw | Gier (see Wiki Roll-Nick-Gier) | ° | supposed |
| pitch | Nick (see Wiki Roll-Nick-Gier) | ° | supposed |
| motor_status | Motor Status, bitwise. Motor numbers according the picture in the GUI | bits | supposed |
| imu_status | IMU Status (inertial measurement unit – see Wiki) | bits | supposed |
| gps_status | GPS unit status | bits | supposed |
| cgps_used | Controller GPS/Compass (2 highest bit from imu_status) | 2 bits (0..3) | supposed |
| press_compass_status | Sensor status (Barometer, Magnetometer) | bits | supposed |
| f_mode | Code for different flight modes (see table below) | code | checked |
| gps_pos_used | GPS position used (true, false) | boolean | checked |
| vehicle_type | Copter type | code | checked |
| error_flags1 | Error flags, bitwise | bits | checked |
| gps_accH | Horicontal GPS accuracy. Seems to be HDOP (see Wiki - GPS HDOP) | HDOP | supposed |
| | | | |
| RemoteGPS (STxx) | | | |
| Date / Time | Date / time including milliseconds | JJJJMMTT<br>hh:mm:ss:zzz | checked |
| lon | Longitude - GPS coordinates of the ground station | decimal degrees | checked |
| lat | Latitude - GPS coordinates of the ground station | decimal degrees | checked |
| alt | Height from GPS relative to sea level | m | checked |
| accuracy | Accuracy of GPS? | Unkown, lower is better, zero means no GPS | |
| speed | Speed, unknown source (maybe computed from GPS coordinates), unknown unit | ? | |
| angle | Angel of moving direction | -180° to +180° | supposed |
| | | | |
| Remote (Radio) | | | |

| Column header | Description | Unit | Status |
|---|---|---|---|
| Telemetry (Copter) | | | |
| Date / Time | Date / time including milliseconds | JJJJMMTT hh:mm:ss:zzz | checked |
| CH0 | Channel 1: J1 throttle/ascent (thr) | 0=Motor start/stop (B3) 2048=neutral | checked |
| CH1 | Channel 2: J4 roll (ail) | 2048=neutral | checked |
| CH2 | Channel 3: J3 nick (ele) | 2048=neutral | checked |
| CH3 | Channel 4: J2 yaw (rud) | 2048=neutral | checked |
| CH4 | Channel 5: S4 Flight mode | 3412=Smart 2048=Angle 683=RTH | checked |
| CH5 | Channel 6: A02 - RTH | 2048=neutral 4095=RTH | checked |
| CH6 | Channel 7: K2 Camera tilt | 683=horizontal (0°), 3413=vertical down (-90°) | checked |
| CH7 | Channel 8: K1 Camera pan | | checked |
| CH8 | Channel 9: S1 Gimbal Tilt Mode | A=2184, V=3412 | checked |
| CH9 | Channel 10: S2 Gimbal Pan Mode | F=683, Team=1433, Center=1502, G=3412 | checked |
| CH10 | Channel 11: S5 Landing gear | 0.0=up 4095.0, 1.0=down | checked |
| CH11 | Channel 12: B2 Aux button | 3412=off 683=Button pressed | |
| CH12 | Channel 13: A09 | | |
| CH13 | Channel 14: A10 | | |
| CH14 | Channel 15: A11 | | |
| CH15 | Channel 16: A12 | | |
| CH16 | Channel 17: A13 | | |
| CH17 | Channel 18: A14 | | |
| CH18 | Channel 19: A15 | | |
| CH19 | Channel 20: A16 | | |
| CH20 | Channel 21: A17 | | |
| CH21 | Channel 22: A18 | | |
| CH22 | Channel 23: A19 | | |
| CH23 | Channel 24: A20 | | |

## 3.4.2   Examples channel value settings

| Value | Remark | Value |
|---|---|---|
| 0 | i.e. Motor off | -150% |
| 683 | i.e. RTH stick min | -100% |
| 1433 | i.e. Panmode team (pan on right stick) | -45% |
| 1502 | i.e. Panmode 'Center' | -40% |
| 2048 | neutral | 0% |
| 2184 | i.e. Tilt mode A | 10% |
| 3412 | i.e. Smart mode Stick max | 100% |
| 4095 | Max setting | 150% |

\* Note: Channel assignment is only valid for stock STxx with Mode 2. For ST16 assignment can be changed by user. Also the mode of the may be changed by user, which changes assignment to throttle, yaw, roll and pitch accordingly.
CH0 in FlightLog data means Ch1 in Channel settings on ST16 (and so on for all channels).

### 3.4.3  Yuneec Breeze raw data

| Column header<br>FlightLog | Description | Unit | Status |
|---|---|---|---|
| UTC | Timestamp | YYYY-MM-DD hh:mm:ss | iOS: Local time<br>Android: UTC |
| TimeStamp | Timestamp number | 0..255 incremented | |
| flightMode | Flight Mode | See Breeze Flight Modes | |
| distance | Distance from Take Off point to center for Selfie, Orbit and Journey modes | 131 - 656 (13.1ft - 65.6ft)<br>40 - 200 (4m - 20m) | supposed |
| height | Standard height | 13 - 66 (1.3ft - 6.6ft)<br>7 - 20 (0,7m - 2m) | supposed |
| loseGPSAct | Fail Save Action | 0 or 1 | |
| goHomeHeight | RTH hight | 98 - 2625 (9.8ft - 262.5ft)<br>30 - 300 (3m - 30m) | supposed |
| maxHeight | Geo fence Maximum Height | 98 - 2625 (9.8ft - 328.1ft)<br>30 - 800 (3m - 80m) | supposed |
| maxDistance | Geo fence Maximum Distance | 328 - 3281 (32.8ft - 328.1ft)<br>100 - 1000 (10m - 100m) | supposed |
| maxSpeed | Maximum Speed | 328 - 1640 (3.28ft/s - 16.4ft/s)<br>100 - 500 (1m/s - 5m/s) | supposed |
| alt | Altitude | cm | supposed |
| IMU_Sta | IMU Status | Status bits | |
| lat | Coordinates, Latitude | 518800483 | |
| lon | Coordinates, Longitude | 63090397 | |
| AutoTakeOFF | Flight rule | 0 | |
| roll | Roll angle | 308 | |
| pitch | Pitch angle | 344 | |
| yaw | Yaw | -8495 | |
| motorStatus | Motor Status | 15 | |
| errorFlags | Error Flags | 0 | |
| nsat | Number satelites, GPS fix | Signed decimal + GPS Fix Flag | supposed |
| voltage | LiPo  remaining capacity | 0..255 (255=100%) | supposed |

See also the guide by *DoomMeister*:
https://drive.google.com/open?id=1QxNGsjg01hMPw7x_1W-iwRedh0BPPnLx
from https://yuneecpilots.com/threads/guide-to-analyzing-breeze-cam-flightlogs-your-data-is-needed.11652/

## 3.5    Flight Modes

### 3.5.1    Flight modes Yuneec legacy and Blade Chroma

| f_mode | class FModeData | Meaning | Display |
|--------|------------------|---------|---------|
| 0 | FMODE_BLUE_SOLID | Stability mode (Blue solid) | THR |
| 1 | FMODE_BLUE_FLASHING | Blue flashing - GPS off | THR |
| 2 | FMODE_BLUE_WOULD_BE_SOLID_NO_GPS | Blue - GPS lost | THR |
| 3 | FMODE_PURPLE_SOLID | Angle mode (Purple solid) | Angle |
| 4 | FMODE_PURPLE_FLASHING | Purple flashing - GPS off | Angle |
| 5 | FMODE_PURPLE_WOULD_BE_SOLID_NO_GPS | Angle mode (Purple solid) - GPS lost | Angle |
| 6 | FMODE_SMART | Smart mode | Smart |
| 7 | FMODE_SMART_BUT_NO_GPS | Smart mode - GPS lost | Angle |
| 8 | FMODE_MOTORS_STARTING | Motor starting | Start |
| 9 | FMODE_TEMP_CALIB | Temperature calibration | Temp |
| 10 | FMODE_PRESS_CALIB | Pressure calibration | Pre Cali |
| 11 | FMODE_ACCELBIAS_CALI | Accelerator calibration | Acc Cali |
| 12 | FMODE_EMERGENCY_KILLED | Emergency/Killed | EMER |
| 13 | FMODE_GO_HOME | RTH coming | Home |
| 14 | FMODE_LANDING | RTH landing | Land |
| 15 | FMODE_BINDING | Binding | Bind |
| 16 | FMODE_READY_TO_START | Initializing, Ready to start | Ready |
| 17 | FMODE_WAITING_FOR_RC | Waiting for RC | No RC |
| 18 | FMODE_MAG_CALIB | Magnetometer calibration | Mag Cali |
| 19 | FMODE_UNKNOWN | Unknown mode | |
| 20 | FMODE_RATE | Agility mode (Rate) | Rate |
| 21 | FMODE_FOLLOW | Smart mode - Follow me | Follow |
| 22 | FMODE_FOLLOW_NO_GPS | Smart mode - Follow me - GPS lost | THR |
| 23 | FMODE_CAMERA_TRACKING | Smart mode - Camera tracking | Watch |
| 24 | FMODE_CAMERA_TRACKING_NO_GPS | Camera tracking - GPS lost | THR |
| 26 | FMODE_TASK_CCC | Task Curve Cable Cam | CCC |
| 27 | FMODE_TASK_JOUR | Task Journey | JOUR |
| 28 | FMODE_TASK_POI | Task Point of Interest | POI |
| 29 | FMODE_TASK_ORBIT | Task Orbit | ORBIT |
| 32 | FMODE_ANGLE_MODE_IPS_ONLY | Indoor Positioning System | IPS |
| 33 | ? | Waypoints | WAYPOINT |

### 3.5.2    Flight Modes Yuneec Typhoon H Plus

| f_mode | Meaning | Display | Status |
|--------|---------|---------|--------|
| 4 | Manual mode (without GPS support) | Manual Mode | supposed |
| 5 | Angle mode | Angle Mode | supposed |
| 6 | Smart mode | Smart Mode | supposed |
| 7 | Sport mode | Sport Mode | supposed |
| 10 | unknown | ? | |
| 12 | RTH coming | ? | supposed |
| 13 | RTH landing | ? | supposed |
| 17 | unknown, very rare, possibly a wrong data set | ? | |

### 3.5.3 Flight Modes Blade 350QX (found by try and error)

| f_mode | Chroma (380QX) | Display | Blade 350QX |
|---|---|---|---|
| 0 | Stability mode (Blue solid) | Stab | |
| 1 | Blue flashing - GPS off | Stab | |
| 2 | Blue - GPS lost | Stab | |
| 3 | Angle mode (Purple solid) | AP | Waiting for RC |
| 4 | Purple flashing - GPS off | AP | Initializing |
| 5 | Angle mode (Purple solid) - GPS lost | AP | Motor starting |
| 6 | Smart mode | Smart | |
| 7 | Smart mode - GPS lost | AP | |
| 8 | Motor starting | Start | Emergency |
| 9 | Temperature calibration | Temp | RTH landing |
| 10 | Pressure calibration | Pre Cali | Agility - GPS off |
| 11 | Accelerator calibration | Acc Cali | Stability |
| 12 | Emergency/Killed | EMER | Smart Mode |
| 13 | RTH coming | Home | Agility Mode |
| 14 | RTH landing | Land | RTH coming |
| 15 | Binding | Bind | |
| 16 | Initializing, Ready to start | Ready | |
| 17 | Waiting for RC | No RC | Magnetometer calibration |
| 18 | Magnetometer calibration | Mag Cali | |
| 19 | Unknown mode | | |
| 20 | Agility mode (Rate) | Agil | |
| 21 | Smart mode - Follow me | Follow | |
| 22 | Smart mode - Follow me - GPS lost | Follow | |
| 23 | Smart mode - Camera tracking | Track | Binding |
| 24 | Camera tracking - GPS lost | Track | |
| 25 | | | AP Mode |

### 3.5.4 Flight Modes Yuneec Breeze

| flightMode | Breeze Flight modes | AutoTakeOFF | Breeze Flight modes |
|---|---|---|---|
| 0 | | 0 | On the ground |
| 1 | | 1 | Take off |
| 2 | Selfie | 2 | Flying |
| 3 | No Mode (No Task Selected) | | |
| 4 | Follow Me | | |
| 5 | Journey | | |
| 6 | Pilot | | |
| 7 | Orbit | | |
| 8 | Return To Home | 16 | Self landing |
| 9 | | | |
| 10 | Pilot (No GPS) | 18 | Pilot landing |

## 3.6 Thresholds / color coding

| Meaning | Color | Date/time | fsk_rssk | gps_accH |
|---|---|---|---|---|
| Poor | Red | >2s | >85 | >2,5 |
| Reasonable | Light red | 600ms-2s | 70-85 | 1,8-2,5 |
| Good | Light green | | 55-70 | 1-1,8 |
| Very good | Green | | <55 | <1 |
| Maximum values | Yellow | | | |

All thresholds are self-defined and only for orientation in the raw data.

## 3.7    Short description – Prepare telemetry for DashWare

Step 1: Prepare DashWare (only once the first time):
- download and install latest DashWare from http://www.DashWare.net/DashWare-download/
- download profile "Yuneec Q500 v1.5" from http://www.drohnen-forum.de/index.php/Thread/12303-ST2Dash-der-Flightlog-Konverter-f%C3%BCr-die-ST10-Q500/
- unzip "Yuneec Q500 v1.5.xml" and copy it to the Profile directory of DashWare: %HOMEPATH%\Documents\DashWare\DataProfiles\
- restart DashWare. Now the new profile for Yuneec telemetry data from ST2DASH or q500log2kml is available every time you use DashWare. Done.

Step 2: Convert telemetry file to DashWare format that fits the profile:
- download and install "q500log2kml" from here: http://h-elsner.mooo.com/downloads/q500log2kml_en.zip
- read the description (OK, this you have done at this point)
- select Data conversion output format "dashw.csv" in tab "Settings"
- convert all the telemetry data of real flights in one step to DashWarefiles by click on Convert

Step 3: Use video files and fitting converted DashWarefile (i.e. Telemetry000xxdashw.csv):
- start DashWare - create a new project
- add one or more video files (I guess DashWare cannot use 4k videos, it must be downsized)
- add converted DashWarefile (i.e. Telemetry000xxdashw.csv) as data logger file
- select "Yuneec Q500 v1.5" as relating profile
- synchronize telemetry/video and do all the stuff that you want to do with your project...