

# Cumulus

A Linux-based flight navigation program for the soaring community

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# Cumulus



Cumulus is a program designed for the soaring community. It provides a moving map display with all the information you need to make navigation easier while flying, yet requiring a minimum of user interaction. Navigation during flight is based on the processing of standard NMEA records delivered by a GPS receiver. Additionally, the proprietary NMEA sentences of some logger devices can be included in the processing.

Cumulus features a full colour moving map with information on terrain, point data, airspace, (rail-) roads, water, cities and many other details. It handles waypoints, IGC logging and tasks in cooperation with KFLog. Wind determination, reachable sites, final glide, sunrise and sunset calculations, retrieving of airport weather reports (METAR and TAF), live tracking of flights as well as automatic task point switching are also supported.

## Software license agreement

Cumulus is distributed as open source under the GPLv3 license. See [here](#) for the license conditions.

## Important hint to all program users

***This program comes with ABSOLUTELY NO WARRANTY!***

*Do not rely on this software program as your primary source of navigation. As pilot in command you are responsible for using official aeronautical charts and proper methods for safe navigation. The information presented by this application may be outdated or incorrect.*

*This software may not be used as a traffic and collision-warning system!*

*You use this program at your own risk. If you don't agree, don't use this software!*

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## Getting Started

To take full advantage of Cumulus, you need a PDA with either an internal or an external GPS receiver and a set of map files. Currently Cumulus supports the following hardware devices:

- Android devices up release level 2.2.x (FroYo) and higher with a screen resolution 800x400 and higher in landscape mode
- The Nokia Internet Tablets N800/N810 with Maemo OS2008
- The Nokia Internet Tablet N900 with Maemo OS2009
- PC Linux desktop running Debian or Ubuntu

When you start Cumulus, it will create all the necessary data directories by itself, if they do not already exist. Furthermore you will be asked once whether you want to download missing airfield or map files from the Internet. Your decision is valid until to the termination of the program. If Cumulus is moving no file downloads are executed. Only enable the automatic download if you have an active Internet connection running!

### PDA

As long as the program runs on the PDA and you are on the move, the automatic shut-down of the screen to save battery life is deactivated. If you move slower than the defined speed limit, the screen is switched off after a certain time. If you then move faster, the screen is automatically switched on again. The speed limit can be configured in the [Look&Feel](#) settings.

For operation over several hours you need to supply external power to your PDA. Furthermore, it is recommended that you switch off all automatic connection or update attempts (WLAN, version updates, ...) before take-off, as these can rob Cumulus of resources, slowing it down for a while and irritating you with popup dialogs.

### Android Hints

Please notice, that some functions under Android are only reachable via the *Android Menu Key* and not over the internal Cumulus menu. That concerns the GPS receiver and the barometric sensor. After every startup of Cumulus you must switch on again these functions! The previous state is not saved.

### Android's Barometric Sensor

If your Android device has a built in pressure sensor, you can activate it, that it delivers air pressure data. If you want to use these data in Cumulus, you have to switch the [altimeter display](#) to Baro. Furthermore you have to adjust the altimeter to the correct MSL altitude.

Please notice, that in this case no other external connected devices deliver barometric altitude data, otherwise you can get displayed wrong values.

### Possibilities to connect to external GPS devices

Cumulus can be operated with build-in or external GPS devices. A GPS

device can be connected via Serial (RS232), USB or Bluetooth from Cumulus. The following variants are possible for connection to a GPS receiver:

- **Linux PC**
  - Serial (RS232)
  - USB
  - Bluetooth
  - WiFi
- **Nokia Internet Tablet N8x0**
  - Build-in GPS
  - USB
  - Bluetooth
- **Nokia Internet Tablet N900**
  - Build-in GPS
  - Bluetooth
- **Android device**
  - Build-in GPS
  - Bluetooth
  - USB-IOIO
  - WiFi

## GPS Hardware

Many flight recorder and also Flarm provide only a serial interface as link to other devices. To connect to such devices you need an adapter. Cumulus supports the following adapters:

- Serial-USB adapter (not for Android)
- Serial-Bluetooth adapter
- USB IOIO Uart board (only for Android)

Examples for such adapter:

- Serial-Bluetooth adapter
  - [K6-Team](#)
  - LM TECHNOLOGIES - LM048V2 adapter
- USB IOIO Uart board, firmware 4.0 and higher (only for Android)
  - [SoarTronic's IOIO UART interface board](#)

## GPS Activation

Once you manage to connect your GPS to Cumulus, select the correct device and baud rate in the [GPS Settings](#). Refer to your GPS manual for the correct settings. The most common devices are:

- `/dev/ttyS0` - Serial (RS232) device
- `/dev/rfcomm0` - Bluetooth device
- `/dev/ttyUSB0` - USB device

The default NMEA connection speed is 4800 bps on a RS232 serial channel.

If you have a **Nokia Internet Tablet** N800/N810 or N900, it is not necessary to set up a special GPS device. Available devices will be

recognized automatically during Cumulus start-up, unless you want to connect to a GPS device via USB. In this case you have to select the USB device from the GPS configuration options.

If you have an **Android** device with a built in GPS nothing has to be setup. To external GPS devices is only a connection possible via Bluetooth radio or an USB IOIO Uart board. A USB IOIO Uart board must be configured and activated via the Android menu before you can use it. See [GPS Settings](#) for more information.

**Note the following exception!** After every startup of Cumulus under Android the GPS receiving **must be enabled by hand**. To do that, press the **Android Menu key**, select the entry *GPS on* and choose the desired device (internal, Bluetooth or IOIO). Bluetooth devices must be paired before Cumulus is started. Cumulus does not support BT pairing!

Once your GPS device is set up, press the key **G** or click on the GPS status indicator in the status bar to check the GPS status. You can remove the GPS status page with the Escape key or with the close button.

## Personal

In Personal Settings you define the coordinates of your home position in the area in which you fly. The setting is important to ensure an unskewed map rendering! See [Personal Settings](#) for more details.

## Glider

Define your preferred gliders in Glider Settings. See [Glider Settings](#) for more details.

## Maps

Cumulus uses the same maps as *KFLog*, the KDE Flight Logger. Needed airfield and map files are downloaded automatically by Cumulus, if you enable this option at start-up. To install all the maps around your home position, see [here](#) for more information.

## Waypoints

Cumulus uses waypoints to facilitate navigation. You can either edit the waypoint files on the PDA or prepare them on a PC using *KFLog* or *Cumulus* and then transfer them to the PDA. See [waypoints](#) for more details.

## Tasks

Cumulus also supports the definition of flight tasks. You can either create and edit a task file on the PDA or prepare it first on your PC using *KFLog* or *Cumulus* before transferring it to the PDA. See [here](#) for more details on tasks.

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## Maps

Cumulus uses the following sets of maps:

- **Ground and Terrain Maps** with streets, highways, cities, rivers, lakes, ... and terrain data with elevation information. These cover the entire world. The maps are to be found in the [KFLog Map Room](#). Cumulus is able to download all the map files that you need. See [Map-Settings](#) for more information.
- **Airspaces:** Cumulus supports the *OpenAir* and the *openAIP* file format for airspace structures. Further hints you can find [here](#).
- **Point Data:** Sources for airports, airfields, nav aids and outlandings are:
  - [openAIP](#) project. It provides airfields, nav aids and hotspot data but no outlandings at the moment.

The maps are installed in different places depending on the used device:

OS	Map root directory
Linux Desktop	\$HOME/Cumulus/maps
Maemo	\$HOME/MyDocs/Cumulus/maps
Android	/sdcard/Cumulus/maps (internal or external SD-card)

These are the default locations.

On the Nokia Internet Tablet you should use an external storage medium if possible, because the internal file system is limited in its capacity. At the first startup on the Nokia Internet Tablet, Cumulus itself tries to discover the best location for storing the map files. The following places are checked for existence in chronological order:

- /media/mmc1/Cumulus
- /media/mmc2/Cumulus
- /home/user/MyDocs/Cumulus

The first match is taken and the necessary subdirectories are created by Cumulus itself.

**Please note! The map files have to be stored in different subdirectories under the root map path.**

Directory	Map kind
.../maps/landscape	The ground and terrain data files

<b>.../maps/points</b>	POI data files like airfields, outlandings, nav aids and hotspots
<b>.../maps/airspaces</b>	The airspace files

If you want to install the maps elsewhere than the known locations, you must give the path to the new map root directory on the [Map Settings](#) configuration page. Use the [Maps](#) button to navigate to the appropriate root directory under which the expected maps' subdirectories are to be found.

**Note! Under Android you cannot change the map root directory.**

Only load the point data and the airspace maps for the area you need. This will make Cumulus faster and save runtime memory. If you experience memory problems running Cumulus, you can choose not to install certain map sets. You could, for instance, skip the terrain maps. This will disable the display of terrain features (the isolines) but it will also save memory and reduce the time used for map loading and drawing. It is advisable to use at least the Ground maps because otherwise you will end up with a blue background, which is not very helpful for navigation.

The maps you install are not projected. This work is done on loading. Because this is a computationally complex operation, the resulting maps are stored again with a *.kfc*, *.aic* or *.txc* extension. For many maps, these files are a bit smaller than the original files. The next time Cumulus needs to load the file, it first tries to load this *compiled* file to improve speed. In the [Map Settings](#) page you can modify the behaviour of Cumulus for map projection and map compilation.

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## Maps - Airspace

Cumulus supports two different source formats:

- OpenAir
- openAIP

as database for airspaces.

### OpenAir

*OpenAir* files must be downloaded manually from the Internet and installed in Cumulus. Addresses where you can find *OpenAir* airspace files are:

- [Soaring Services - Airspace](#) for many countries of the world
- [Airspace Data Germany \(Deutschland\)](#) published by the DAeC

### openAIP

[openAIP](#) airspace files can be found on the openAIP website, where this project is hosted. The download and installation of openAIP airspace files is supported by Cumulus. See [here](#) for further help.

### Installation Directory

Just put your airspace files in the directory **.../maps/airspaces** and make sure, that OpenAir files have the *.txt* extension while openAIP files uses the *.aip* extension. The extension spelling is not case sensitive for *.txt* files.

Because you can have a lot of airspace files in the airspace directory, maybe one for every country, it is useful to define, which files should be loaded only to save run-time memory. That can be done in the configuration setup for [Airspaces](#). Press the Load button on that page and select the airspace files in the displayed list to be loaded.

### Mapping Services

Certain OpenAir/openAIP airspace elements are not unique mapable to Cumulus airspace elements. Therefore Cumulus provides additional mapping services.

- One global mapping file
- Special mapping files, related to one airspace file

The mapping files must be placed in the same directory as the airspace files are installed. Their rules overwrite the default Cumulus mapping rules.

### Global Mapping File

The global mapping file is applied first to all read airspace file. The name of the file is *airspace\_mappings.conf*.

## Special Mapping Files

Special mapping files can be applied only once to a related airspace file. Such a file consists of the basename of the airspace file without the extension *.txt* or *.aip*, extended by the string *\_mappings.conf*.

**Example:** SourceFile=*openair.txt*, MappingFile=*openair\_mappings.conf*

**Cumulus knows the following airspace types:**

- AirA
- AirB
- AirC
- AirD
- AirE
- AirF
- AirUkn
- Ctr
- Danger
- Prohibited
- Restricted
- LowFlight
- Rmz
- Tmz
- GliderSector
- WaveWindow

The syntax used in the mapping file is very simple. Lines starting with *#* or *\** are ignored and can be used for comments. Empty lines are also ignored. The rest of the lines should contain entries in the form *key = value*, one entry per line. The key is the airspace type in the OpenAir/openAIP file you wish to map, and the value is the corresponding Cumulus type you wish to assign.

## Default mapping for OpenAir

- A = AirA
- B = AirB
- C = AirC
- D = AirD
- E = AirE
- F = AirF
- CTR = Ctr
- GP = Restricted
- P = Prohibited
- Q = Danger
- R = Restricted
- RMZ = Rmz
- TMZ = Tmz

- TRA = Restricted
- GSEC = GliderSector
- UKN = AirUkn
- W = WaveWindow

### Default mapping for openAIP

- A = AirA
- B = AirB
- C = AirC
- D = AirD
- E = AirE
- F = AirF
- DANGER = Danger
- PROHIBITED = Prohibited
- RESTRICTED = Restricted
- CTR = Ctr
- TMA = Ctr
- RMZ = Rmz
- TMZ = Tmz
- GLIDING = GliderSector
- OTH = AirUkn
- WAVE = WaveWindow

**Note!** You only need to define the values you actually want to change in the read airspace file. These instructions will overwrite the default mappings.

**Example:** *CTR=AirC*

This statement changes the default assignment for *Control Zone* to *Airspace C*.

**Remember that the mapping definitions are case-sensitive! Otherwise the mapping rules will fail.**

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## openAIP - Navigation Data

[openAIP](#) has the goal to deliver free, current and precise navigational data to anyone. *openAIP* is a web-based crowd-sourced aeronautical information platform that allows registered users to add, edit, download and comment aeronautical data in many common formats used in General Aviation.

As first you should register yourself by the [openAIP](#) project, that you can use their provided data.

Please read and accept the [Terms and Conditions](#) from [openAIP](#), before you download and use their data with Cumulus.

**Caution!** Please note, that all openAIP files carry the extension **.aip**. You should never change that extension otherwise Cumulus cannot recognize these files.

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### openAIP Airfield, Navaid and Hotspot data

Cumulus can download and install on user request *openAIP* airfield, navaid and hotspot files. Go to the [Settings/Point Data - openAIP](#) page and make there your desired settings.

### openAIP Airspace Data

Cumulus can download and install on user request *openAIP* airspace files. Go to the [Settings/Airspaces](#) page and make there your desired settings.

---

**Please help to improve the *openAIP* data. If you found mistakes, correct them. If you miss something, add it to the *openAIP* data base.**

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## Settings

Press the key **s** to open directly the settings page. The normal way is, to press the menu button or the **m** key on the PDA to open the pop up menu. Then navigate to *Setup->General*.

The opened table contains all basic configuration pages of Cumulus. It is separated into 15 sections:

- [Personal](#)
- [GPS](#)
- [FLARM](#)
- [Gliders](#)
- [Maps](#)
- [Map Objects](#)
- [Terrain Colors](#)
- [Task](#)
- [Lines](#)
- [Point Data](#)
- [Airspaces](#)
- [Units](#)
- [Wind](#)
- [Information](#)
- [Look&Feel](#)

**Note!** If you have done modifications on a single setting window and you want to make them permanent you must leave this window by pressing the green *Ok* button. To cancel all done modifications, use the red *Cancel* button instead of.

FYI, all internal configuration data are stored by Cumulus in the user directory `$HOME/.config` in the file *Cumulus.conf*. Under Android this file is to find in the directory `/sdcard/Cumulus/Settings`. Do only modifications there, if you know what you do and Cumulus is not running!

**WARNING: Make your settings while safely on the ground, not while flying!**

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## Settings - Personal

### Personal

On this page you can enter and define your personal data.

#### Pilot name

This data is used as pilot's name for the IGC logfile.

#### Language

Select the language which you do prefer. English is always the default also in case if your selection do fail. After a language change you must restart Cumulus to get a complete translated surface.

#### Home site country

The home site country has to enter as two letter code according to ISO 3166. It is used as default setting, if the waypoint editor is opened to create a new waypoint. The country code is set too, if a new home position is selected in one of the overview lists.

#### Home site name

Enter here the name of your home site. This value is displayed in the To box, if you navigate to your home site.

#### Home site elevation

Enter here the elevation of your home site. This value is taken into account if you select AHL (above home level) in the altitude dialog. In this case the displayed altitude is related to your home base also referred as QFE.

#### Home site coordinates

The home site coordinates are used for:

- The [Map Projection Settings](#)
- The [Manual Navigation](#)
- As center point for the point data to be read, when the [radius option](#) is set.
- As predefined center point for the map download procedure.

The home site coordinates can also be set in the airfield and waypoint pages. In this case the data are taken over from these pages and a manually entry is superfluous. The default home position is set at the Brandenburger Tor, in the center of Berlin (Germany).

### Data Directory

With the Button **Data Directory** and the text entry field beside you can define a new storage place for your waypoint, task and IGC logger files. The default storage place of Cumulus is:



- **\$HOME/Cumulus** on the Linux desktop PC
- **\$HOME/MyDocs/Cumulus** under Maemo (Nokia Internet Tablet)
- **/sdcard/Cumulus or similar** under Android (internal SD card not changeable)

On the Nokia tablets N8x0 it is recommend to define a new location, which lays on one of the SD cards (/media/mmc1 called external card or /media/mmc2 called internal card). The SD cards are accessible with the Maemo file manager and also via USB. So you can transfer your data files between your PC and the Internet Tablet very conveniently.

When you press the Data Directory button, a directory dialog is opened and you can navigate to another directory storage place. Use short double taps on the Nokia tablets for moving between the directories. The directory dialog shows only existing directories. If you want to create a new subdirectory you have to add the new pathes in the text field by hand. Cumulus tries to create the new subdirectories, if you leave the settings dialog with the Ok button.

E.g.

**/media/mmc1/Cumulus or /media/mmc2/Cumulus**

should be good places for use on the Nokia N8x0 tablets. Note, if you change the data directory no files will be transfered automatically by Cumulus to the new area. Such moves must be done alone by your self, if Cumulus is **not running!**

**Notice!** The data directory is not changeable under **Android**. It is always located at the internal SD card. In the display field you can see where the real place is of it.

### Proxy

If you can access the Internet only via a Proxy, press the button *Proxy* and define it there.

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## Settings - GPS and other peripheral devices

### GPS

This page is used for entering the connection information for the primary GPS device used by Cumulus for navigation. Please refer to your GPS manual for these connection values. Cumulus can also accept and process data from other peripherals such as Cambridge, Volkslogger, Flarm or LX Navigation.

#### Android Hints

Under Android this page is nearly empty. Please use the Android menu key and the GPS menu to switch on/off your desired GPS device. There are exist different possibilities according to the provided hardware of your Android device.

- Use of build-in GPS.
- Connection establishment via Bluetooth to a GPS device. If the GPS device does not support Bluetooth you will need an adapter to connect the device.
- Connection establishment via an USB IOIO Uart board to a GPS device with a serial interface. Cumulus supports that at the moment only for IOIO boards with firmware 4.0 or higher and for only one Uart. The IOIO uart to be used and its connection speed have to setup via the Android menu key, Setup, IOIO GPS. If you use an **Android** device with **OS release < 4.1** you have to **switch on USB debugging** in the developer options. If the **OS release is >= 4.1 USB debugging must be switched off**. Otherwise you will never get a connection running.

Cumulus can provide you with some status information concerning your GPS reception. If you want to know what satellites are in view, where they are, how strong their signal is, or if you want to take a look at the raw NMEA stream of your GPS, use the **G** key or click on the GPS status indicator in the status bar. This will open a status dialog for the GPS. The dialog can be closed with the "close" button.

#### GPS Device

In the combo box you can select the connection type to be used for your GPS or peripheral connection. The following alternatives are available:

Item	Description
<b>GPS Location</b>	only for using the Location Service provided by the Internet Tablets N8x0/N900. Users of the N8x0 or N900 can make use of the option in the tablet's own Settings/Control panel/GPS location to use either the built-in GPS receiver

	or an external Bluetooth GPS device.
<b>BT Adapter</b>	for direct connection to an external Bluetooth device, which has been paired with the OS BT manager before. In this case Cumulus will automatically scan your environment for a reachable device, and, if it finds one, will open up a combo box dialog from which you can make the appropriate selection. A wrong selection will mean that you will have to restart Cumulus!
<b>/dev/ttyS[0...3]</b>	for a serial GPS device like Flarm, using an RS232 interface. <b>Note!</b> On a Linux desktop, e.g. Ubuntu, it is required, that the Cumulus user must be a member of the Linux group <i>dialout</i> . Otherwise the device ttyS0 cannot be opened. Execute the following command to enable that:  <i>sudo gpasswd --add &lt;cumulus_user&gt; dialout</i>
<b>/dev/ttyUSB0</b>	for a USB GPS device or, e.g., a USB-serial adaptor
<b>WiFi 1, WiFi 2 oder WiFi 1+2</b>	for a WiFi connection to an external device. You can use up to two channels. Per channel you have to add an IP address and the related port. The coupling to the external device have to be done by using the WLAN manager of your OS. E.g. to connect to a XCVario you have to enter the following values:  WiFi-1 IP:Port 192.168.4.1:8880 (XCVario Data)  WiFi-2 IP:Port 192.168.4.1:8881 (Flarm Data)
<b>/tmp/nmeasim</b>	for the Cumulus NMEA Simulator

Serial devices and RS232-USB adapters also need to be given a speed rate for their operation. The default serial NMEA connection speed is 4800 bps but we recommend always to use the maximum supported speed.

If your device is not found in the selection list, you can change one of the predefined entries to what you need, e.g. /dev/ttyS0 for an RS232 serial.

#### Speed (bps):

This will have the greyed-out default value unless e.g. the connection selected above is to a device whose speed can be manually set.

#### Altitude Reference

Item	Description
<b>GPS</b>	The default selection is GPS. Most GPS devices send MSL (mean sea level) altitudes, but some send HAE (Height above ellipsoid).
	Some external devices, e.g. Flarm, XCVario can deliver altitude

**Pressure**

values derived from a pressure sensor. If you want to use these pressure data, select this alternative.

**Please note!** If you have selected the pressure item, Cumulus expects to receive the appropriate NMEA records from the connected peripheral device. Without these you will not get any altitude data displayed at all, nor will you get a variometer reading, unless this information is supplied separately by the peripheral!

If your displayed altitude always deviates by a constant factor from the expected value, you can correct this in the altitude dialog. This is opened by tapping on the altitude display in the map view. Add your correction value in the box labelled with *QNH Altitude*. Positive values will be added to and negative values subtracted from the delivered altitude value. For pressure values, the correction will be applied immediately after pressing Ok. For GPS values, the correction will only be applied when a GPS fix is established.

**Processed data from supported devices**

Cumulus processes additional data from the devices listed below, if they are connected, but only if the data sentences have a valid checksum. Data from external devices are the first choice for Cumulus before its own calculation is started. This means that the wind, variometer and MacCready data from these peripheral devices will be accepted and used automatically, if they are available. The MSL and STD altitudes derived from a pressure sensor, however, are only made use of if specifically asked for, i.e., "Pressure" must be selected in the menu.

Device	Processed data
Cambridge	This device can deliver altitude values (MSL and STD) derived from a pressure sensor. Cumulus also uses the QNH, wind and McCready data from the Cambridge Iw proprietary sentence (see below).
Volkslogger	This device can deliver the STD altitude derived from a pressure sensor. To get the right MSL altitude, you have to set the correct QNH value in the Cumulus <a href="#">Preflight Settings/Common</a> or in the altitude dialog. Furthermore, in the Volkslogger setup menu, you have to enable the sending of PGCS records.
LX Navigation	This device can deliver altitude values derived from a pressure sensor and wind data. Some devices can also deliver McCready and variometer data. Enable the sending of LXWP records in the LX setup menu, as follows (e.g. on an LX20 device you will have to enter the password - the default is 96990): go to the NMEA menu, where you should set the entry LXWP? to 'Y'. Set the transfer speed in Cumulus to 4800 bps - the LX20 device uses this speed for NMEA transfer regardless of the selected PC transfer speed.

<b>Classic FLARM and PowerFLARM</b>	This device can deliver altitude values derived from a pressure sensor, as well as aircraft and ground obstacles information. Enable the sending of these data in the FLARM setup menu. Look also at the page <a href="#">Cumulus Flarm</a> for more information.
<b>XCVario</b>	It delivers MSL altitude, IAS, variometer, Mc, bugs and temperature data. If a magnetic sensor is connected and activated, magnetic heading is delivered.

### Sync Clock

If the option *Sync Clock* is activated, Cumulus is able to synchronize the PDA system clock to the GPStime, but this will only work, if Cumulus is running as user *root*. On Android and the Nokia Internet tablets this feature is available, because user processes are not normally running under the root user.

### Save NMEA Data

If the option *Save NMEA Data* is activated, the received NMEA data stream is logged into a file. The file is stored in the user's data directory and it has the name *CumulusNmea\_[date].log*. After each new start of Cumulus and if this option is activated in the setup menu, a new log file is opened. Please consider this, if you activate this option. You can use this option to save the GPS NMEA data for a later analyze or any other post-processing. We recommend to use this option only for special purposes because it has also influence to the performance in general.

### GPS Source

With the selection box *GPS Source* you can define the GPS system, from which the default sentences should be processed. The following choice is possible:

- \$GP GPS (USA)
- \$BD GPS Beidou (China)
- \$GA GPS Galileo (Europe)
- \$GL GPS Glonass (Russia)
- \$GN combined GPS Systems

### Processed GPS sentences

Cumulus processes the following NMEA and proprietary sentences:

NMEA Id	Description
[\$BD \$GA \$GL \$GN \$GP]RMC	Recommended Minimum Specific GNSS Data
[\$BD \$GA \$GL \$GN \$GP]GLL	Geographic Position - Latitude and Longitude
[\$BD \$GA \$GL \$GN \$GP]GGA	Global Positioning System Fixed Data

\$[BD GA GL GN GP]GSA	GNSS DOP and Active Satellites
\$[BD GA GL GN GP]GSV	GNSS Satellites in View
\$GPDTM	Map datum
\$PGRMZ	Garmin and FLARM proprietary sentence with barometric or GPS altitude data
\$PFLAU	FLARM proprietary sentence with status, intruder and obstacle data
\$PFLAA	FLARM proprietary sentence with data about other aircraft around
\$PCAIID	Cambridge proprietary sentence with STD altitude
!w	Cambridge proprietary sentence with MSL altitude, QNH setting, wind direction, MacCready value, wind speed and variometer data
\$PGCS	Volkslogger proprietary sentence with STD altitude
\$LXWP0	LX Navigation proprietary sentence with MSL altitude, variometer and wind data
\$LXWP2	LX Navigation proprietary sentence with McCready data
\$POV	OpenVario proprietary sentence.
\$PXCv	XCVario proprietary sentence.
\$HCHDM	Magnetic compass proprietary sentence, magnetic heading.
\$HCHDT	Magnetic compass proprietary sentence, true heading.
\$MAEMO0	Cumulus internal proprietary sentence, if LibLocation from MAEMO 5 is used
\$MAEMO1	Cumulus internal proprietary sentence, if LibLocation from MAEMO 5 is used
\$Android	Cumulus internal proprietary sentence, if the Android device delivers only own location updates and no NMEA data.

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## Settings - FLARM

### FLARM

This configuration page is only available, if Cumulus is not moving.

Cumulus supports two types of FLARM.

- Classic FLARM
- PowerFlarm

The FLARM setup page is organized as a table with the following columns from left to right:

Column	Description
CMD	Get command for the listed item
CMD	Set command for the listed item
Item	Configuration item name
Value	Configuration item value

**Note!** If you want to change items, please inform you before about the possible values of the items. Some SET commands are clearing the FLARM device. If you do not know what are the consequences of a SET command, do not execute it. In every case you should have read the document **FTD-014, FLARM CONFIGURATION SPECIFICATION**. You can request if from [here](#).

#### Column CMD GET

If the CMD GET button is pressed, the value of the listed item is requested from the FLARM device.

#### Column CMD SET

If the CMD SET button is pressed, the value of the listed item is transfered to the FLARM device.

#### Column Item

Under the column *Item* the FLARM configuration items are listed. Read only items have only a GET button, Read-Write items have a GET and a SET button, Write only items have only a SET button.

Clicking on the item header will sort the item list. Double and single clicking of an Item field opens a little help dialog. Tipping at the help box will close it. After 30s the help box is closed automatically.

### Column Value

Under the column *Value* the values of the FLARM configuration items are listed. Clicking of an item *Value* field of a configuration item, which is writable, opens a little editor where you can modify the item value.

### Button Load

Clicking the button *Load* (lower right corner), will request all supported item values from the FLARM device.

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## Settings - Gliders

### Gliders

Cumulus supports multiple gliders that you can configure. You can then choose the glider you will be using for a particular flight from a list and have all the relevant data instantly available. Using the buttons above the list, you can add (paper icon), edit (pencil icon) or delete (trashcan icon) gliders from your list. As with other settings, changes are only stored if you exit the settings dialog with the OK (green with the white tick) button. If you accidentally delete a glider from your list, just tap the cancel (red with the white x) button and you'll be fine.

If you tap the add or edit buttons, you'll be presented with a new dialog. Here you can enter information about your glider. The polar is used for the final glide calculations. Select your glider from the list or enter the correct values for your glider in the boxes. The values represent three points on your glider's polar; these are used to make an approximation to this curve. These points are given as pairs of speed (in km/h) and rate of sink (in m/s). For optimal results, take the values at the speed for best L/D as the first point,  $V_{Ne}$  as the third, and a point halfway between these as the second point.

The box *Ref. weight*: has to contain the dry weight of the airplane when the polar data were measured.

The box *Load corr.*: enables a load correction, if the reference weight is not the correct one for your personal airplane.

If your glider can carry water, leave the full amount entered here, as this value will limit the actual amount you can enter on the [Flight Settings/Glider](#) menu page. The actual Load correction can also be entered on the same page.

If the *Wing area* box contains a non zero value the *Wing load* is calculated and displayed on the polar page. The unit for the wing area is square meters (m<sup>2</sup>), the wing load is displayed in Kg/m<sup>2</sup>

You can see a graphical representation of the resulting polar if you select the **Show Polar** button. Included in this display is information on the speed for the best L/D for the selected glider. Using the cursor rocker you can simulate wind and lift by pressing the up/down (lift) and left/right (wind) buttons. The related tangent is calculated, and the best speed-to-fly and resulting sink are displayed accordingly. With the **Space** key you can return to the original state of the polar.

To add your own types to the selection list, please create your own polar file in the [polar directory](#). Take an existing file in that directory, make a copy of it and edit its content. But better would be to send your polar data to the Cumulus team for adding it into the polar directory.

The values for registration and call sign are used in the IGC logfile and as a unique identifier for the glider.

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## Settings - Maps

### Maps

On this page you can set the maps storage location and the map basic data.

#### Maps Location

As location for the map data for Maemo (Nokia Internet Tablet) you should define a directory on one of the SD cards. With the help of the button *Maps* you can open a directory selection dialog and navigate to the SD card locations to find under `/media/mmc[1|2]`. In the text field beside the button you can see the current selection. You can modify the text field also by hand and set so your preferred location.

#### Projection

The coordinate points of the raw maps Cumulus uses are not projected. They are coded according to WGS84 datum. Therefore all these points are projected on first loading. There are many types of map projections available. You need a projection because the earth is a sphere (or close to it) and your map is flat.

Cumulus supports two projections:

1. *Plate Carrée* - Equidistant Cylindrical Projection
2. *Lambert* - Conical Orthomorphic Projection

The first is computationally simpler and thus the preferred one in Cumulus. The latter is more complex, so your maps will take much longer on first load but it is more realistic. Each map projection needs a basis from where to work.

For the *Plate Carrée* projection choose a parallel close to your home base. If the option *Projection follows Home Position* is activated, the parallel is automatically set to the latitude of your Home Position in the assumption that the Home Position is your preferred flight space. That ensures an unskewed map display and you are not forced to set this parallel by hand. That is the default setting.

For *Lambert* projection you should select the parallels so that they are covering the area you are flying. For example, you could choose the parallels from your official flying map. Then you will have an equal look like these maps. You should select the longitude from the middle of the area you are flying. It is needed because of some technical reasons not for the projection itself. No automatic update of projection data is done here. You must do that always by hand. Therefore use this kind of projection only, if you are familiar with the Lambert projection.

After changing the projection kind or the standard parallel values Cumulus is forced to recompile your map files.

**Please note that:** If you don't set the projection options correctly, you will likely end up with a blue screen or a skewed map. This is especially so if

you are far away from the coordinates used in the projection!

### **Projection follows Home Position**

If this check box is selected a Home Position change will trigger automatically a recompilation of the map files. This option ensures best drawing results but it is only available for the *Plate Carrée* projection.

### **Unload unused maps from RAM**

Cumulus supports two strategies for keeping maps in memory. Maps are only loaded if needed, but they can either stay there until they really need to be moved out of memory, or they can be removed sooner. The first strategy is more suited for users who want to zoom in and out a lot and have plenty of memory in their device, the latter strategy is the default one and to be recommended for people with lower memory devices.

### **Center Latitude/Longitude**

The coordinates of your center point around that map files shall be downloaded from the Internet.

### **Install Maps and Distance**

Define a distance in the spin box around your center point and press then the *Install Maps* button. Cumulus tries to download all map files from the KFLog Map Room, which lays around the center point. Ensure that an active Internet connection is available to that time. Otherwise all downloads do fail. If Cumulus is in move (faster as 5 Km/h) no downloads are executed. If all download requests are processed you will get once a result message. Cumulus does not record a special log file for that. If Cumulus is started in a X-Terminal window you can see the single results as debug messages.

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## Settings - Map Objects

### Map Objects

Here you can choose the items to be loaded and displayed on the map.

#### Memory

If you experience problems with memory consumption or if you just wish to decrease the amount of information displayed on the map, you can choose to turn off some items on the map. These items will then not be loaded anymore. You should restart Cumulus after changing these options, because the options are only effective for newly loaded maps.

#### Performance

Disabling objects in general will increase map load and drawing speed and lower the memory consumption. Especially the isolines are concern of that. If you enable isoline drawing, the background of the map will be colored according to elevation. This coloring will be more detailed if you zoom in and less detailed if you zoom out. **Note that the isolines are needed if you want to use the ground elevation feature!**

#### Item Labels

Disabling the drawing of item labels will turn off labels on the map by default but you can toggle the display also via the menu bar or by using [shortcut keys](#). A label, normally the name of the item, is drawn beside the item, if the option is active. But be carefully with the activation of labels. On higher scales they can hide other map items, if you enable too much.

#### Waypoints

[Waypoints](#) do carry an importance attribute. The following attributes are known:

- low
- normal
- high

Under the group box *Draw Waypoints until this scale* you can define until to which scale an importance attribute is displayed. If the current map scale exceeds these limits, the related waypoint will disappear from the map. With the help of the importance feature you can better control the waypoint display. Do not set too high limits otherwise the labels will hide other important details.



## Settings - Terrain Colors

### Terrain Colors

On this page you can set the colors of the terrain levels. The levels comprise the elevation range from under zero to nearly 9000m. On the left side of the window you can see the currently used colors for the different elevations as bar with a scale at the right side. The scale unit can be in meter or foot depending on your selected preferred altitude unit. In the middle of the window you have in a frame a combo box and different buttons. In the combo box you can select the elevation of the terrain level to be modified. Pressing the button *Terrain Color* popups the color editor in which you can assign a new color if you want.

### Terrain Level

In the combo box you can select the terrain level to be edited. Choose the level and press the button *Terrain Color*.

The level  $< 0$  (subterrain) is used as default ground for the oceans and if there are no ground maps loaded.

### Terrain Color

Pressing the button *Terrain Color* popups a color editor with the color of the selected terrain level. Now you can change the color. With pressing of *OK* this new color will replace the previous one.

### Ground Color

If isoline drawing is switched off, this color is taken as general ground color. Here you have the possibility to define a brighter color to have a better contrast on the map. For instance in the mountains the terrain color maybe to dark, so you can unify the ground color. Pressing the button *Ground Color* popups a color editor with the used color. Now you can change the color. With pressing of *OK* this new color will replace the previous one.

### Color Defaults

Pressing the button *Color Defaults* will reset all colors to the internal defaults of Cumulus.

### Elevation Offset

With the help of the spin box you can move the elevation color index to be used in positive or negative direction. Normally in the flat land you need no offset but in the mountains it could be useful to move down the used color index a little bit to get a better map contrast as result.

## Settings - Task

### Task

Here you can define general task related turn point attributes and figures.  
Supported taskpoint figures are:

- Line
- Circle or Cylinder
- Photo sector
- Sector segment
- Keyhole sector

### Switch Scheme

The switch scheme defines how the automatic switch to the next turn point is executed, if a flight task is active. A flight task can be defined and activated in the [Flight setup Task dialog](#). The automatic task turn point switch provides two modes. In both cases the area specified by the circle or sector has to be actually entered, or at least touched. *Minimum* means that the switch to the next task point will be executed after the distance to the TP, which has up to that time been decreasing, starts to increase, i.e., the minimum distance to the current turn point has been reached. *Touched* means that the switch occurs when the the outer border of the cylinder or sector is first crossed. In both arrival cases, the IGC logger interval is automatically set to one second for a duration of 30s to ensure the recording of the turn point passage. If the checkbox *Report* is activated a detailed information is displayed in the switch moment.

### Shape Box

Here you can define whether the Circle/Sector used has an outer border line or not, and whether this is filled with a transparent colour. Switching off both will make the turn point invisible, if it is not otherwise marked by a symbol, such as an airfield.

The filling defines the transparency of the drawn task point figure.

### Zoom

The check box with the Name *Auto* defines, if the map is zoomed in automatically in the near of the turn point to make the turn point details better visible. If the turn point is passed the old zoom level is activated again except the user has changed the zoom level in the meantime.

### Task Point Figures

Three different task point figures are supported for the start, finish and observation (route) point. Task point figures can be a line, a sector, a sector segment, a keyhole sector or a circle. A circle expect always a radius value in its input box. If a sector is selected as task point figure, you can define a sector centered on the turnpoint. Three parameters can be used for the sector configuration. Radius 1 the *Inner radius* defines a



circle around the task point, whose radius can vary between zero and the value of Radius 2 the *Outer radius*. If the inner and outer radii are equal, the result will be a full circle without a sector. The angle of the sector can vary between 1 and 360 degrees.

In the *Schema* box you can define, which of the provided task point figures should be the default. This default definition can be overwritten in the taskpoint editor for every single task point.

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## Settings - Lines

### Lines

Here you can enable/disable the drawing and define the width and the color of different lines drawn at the map.

### Heading

Enable/disable drawing and define the width and the color of the heading line.

### Path

Define the width and the color of the path line. The path line is the line drawn between the task points.

### Target

Enable/disable drawing and define the width of the target line. The color of this line depends on the reachability of the target.

### Trail

Enable/disable drawing and define the width and the color of the trail line. The trail line is the line of the flown course.

### Task Figures

Enable/disable drawing and define the width and the color of the task figures. The task figures are drawn around task points.

### AS Border

Define the width of the drawn airspace borders. The color depends on the drawn airspace and can be configured [here](#).

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## Settings - Point Data

### Point Data

Cumulus uses the following source:

- [openAIP](#)

as database for point data, such as airfields, radio points, thermal hotspots, etc.

*openAIP* uses one file per country. The advantage of *openAIP* is, that you can bring in directly your own contributions or corrections on their webpage at [www.openaip.net](http://www.openaip.net). A little disadvantage is, that you have to define in Cumulus the countries which you want to install. The rest is done automatically by Cumulus, if you press the download button.

### Terms of use for external data

Please read and accept the Terms and Conditions of

- [openAIP](#)

before you use these data.

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### openAIP - Download

Enter the countries beside the *Download* button, which you want to download from openAIP. The country identifiers have to be encoded according to ISO-3166 as two letter code. Allowed separators are space or comma. Press the *Download* button to get the desired files from openAIP. If Cumulus is in move, no downloads are possible.

Updates of the files are provided in short time intervals without an extra announcement by openAIP. Therefore you should download from time to time again the desired point files to be up to date. **Note!** Cumulus will not do that automatically.

### openAIP - Radius Filter

All point data lying inside your home position radius will be read from the openAIP data files, which are selected on the load page.

**Please Note!** *If the home position is too far away from the area defined by the radius value, no airfield data are shown on the map.*

### openAIP Runway length Filter

Here you can define a minimum runway length for the point data to be read in to filter out objects with too short runways. To switch off the filter set its value to zero.

### openAIP - Load

Pressing the *Load* button opens a table showing all loadable openAIP

point data files. The point data files, downloaded by Cumulus, have the following naming format:

<two-letter-country-code>\_wpt.aip for airfields  
<two-letter-country-code>\_nav.aip for radio navigation facilities  
<two-letter-country-code>\_hot.aip for thermal hotspots

In the header of the table you can see the directory, where the listed files are stored. At the left side of every table row you can see a checkbox. If you activate the checkbox, the listed file is loaded otherwise not. If the box *Check or Uncheck all* is checked, all listed files are loaded by Cumulus. If you want not to load all, deselect as first this checkbox. Only then you can make single selections of files. If you select a whole table row, you can remove the selected data file by pressing the trash button.

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### List Display

In the **List Display** area you can enlarge the height of the list rows applied to the point lists and the reachable list for a better legibility.

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## Settings - Airspaces

### Airspaces

#### Airspace Table

The table shows you which kind of airspaces can be drawn on the map. Mark the boxes of the airspaces you want displayed. To change the colour of the airspace border or the airspace area, touch on the related field in the table. This will open a colour dialog. Pressing the *Color Defaults* button will assign the programmed default colours to all the airspaces.

A special airspace type are Flarm Alert Zones. They issued by Flarm Devices and warn you for airspace usage by other flying objects. It is highly recommended, that you do not fly in in such alert zones!

**Caution!** Warnings are only generated for airspaces which are enabled in the table.

#### Ignore AS

If you enable the checkbox *Ignore AS*, you can setup a vertical border in the spinbox at which an airspace is ignored, if its lower limit lays over the predefined vertical border. The border value uses the unit FL (Flight Level). This feature allows you to filter out upper airspaces and to reduce the drawn items at the map.

#### AS Filters

By using airspace filters you can suppress the showing of single or groups of airspaces, which are not of interest for you.

When you press the button *AS-Filters* a new window is opened in which you can define the filters. Every filter entry consists of three elements.

- State: Activates or deactivates the listed filter.
- Filter definition consisting of country, airspace type and airspace name.
- Command letters up: After pressing this column, all letters of the filter definition will be set to upper cases. Airspaces uses often only upper cases.

The filter to be defined consists of three elements, divided by commas.

1. Country sign as 2 letter code or \* for unknown or all countries.
2. Airspace type as it is shown, e.g. AR or AS-G or CTR, ...
3. Airspace name as sub- or full string. By using substrings you can suppress several airspaces, if the airspace name starts with the substring. Wild cards like \* are unsupported.

**Note!** A filter can also suppress several airspaces, if they use the same name.

Examples:

- *\*,AR,ED-R Lindenberg*
  - \* valid for all countries
  - **AR** Airspace Restricted
  - **ED-R Lindenberg** Name of the airspace.
- *PL,AS-G,TRA*
  - **PL** Only valid for Poland
  - **AS-G** Airspace G
  - **TRA** all airspace names starting with TRA are suppressed.

### Download of openAIP Airspace data

Enter the countries beside the *Download* button, for which you want to download airspace data from the openAIP server. The country identifiers have to be encoded according to ISO-3166 as two letter code. Allowed separators are space or comma. Press the *Download* button to get the desired files from the openAIP server.

**Note!** If Cumulus is in move, no downloads are possible.

Updates of the airspace files are provided in short time intervals without an extra announcement by openAIP. Therefore you should download from time to time again the airspace files to be up to date.

**Note!** Cumulus will not do that automatically.

### Airspace Load

The *Airspace load* button enables you to switch on or off the loading of [airspace files](#) contained in the airspace directory. It opens a table where all available airspace files are listed. In the table header is displayed the directory, where the listed airspace files are to find. At the left side of every table row, beside the file name, is located a checkbox. With the help of this checkbox you can switch on (checkbox is checked) or switch off (checkbox is unchecked) the corresponding file load. If you want to activate the load of all files, enable the checkbox in the upper first row with the title *Select all*. Please note! To make single selections the checkbox *Select all* must be unchecked. Leaving window with *Ok* triggers immediately a reload of the airspace data, if something has been changed.

### Airspace Warnings

You will get an optical and acoustical warning if you are near, very near or inside the specified airspace. If you press the button *Airspace Warnings* you can set the lateral and vertical distances (separately for above and below) that will be applied when generating warnings. If the distance to an airspace is smaller than the specified values, the position is considered *near* or *very near* to the airspace.

The units used for the vertical and horizontal proximity distances can be configured on the [Setting/Units](#) page.

The display duration of warnings and their suppression for a certain time

can be configured on [Settings/Information](#) page.

**Note that Cumulus will only warn you for airspaces that are drawn unless you have activated the check box *Draw all airspaces ... above me*.**

### **Airspace Filling**

The *Airspace filling* button enables you to switch on or off the changing of the airspace fill colour according to the glider's proximity. As you get closer to the airspace vertically or horizontally, the transparency of the airspace fill colour changes, the percentage amount of change being set by the table according to whether you are near, very near or inside the airspace in question. If you disable the airspace filling, a fixed pattern is used for filling.

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## Settings - Units

### Units

Altitudes, Speeds, Distances, Lifts, Wind, Positions and Time Zones can be displayed in different units. Select the units you are comfortable with.

The time zone option provides two time zones *UTC* or *Local*. If *Local* is chosen, all times are displayed according to the selected time zone of your running OS.

Note, the new unit settings take effect in all other menus not until you leave the configuration settings with ok.

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## Settings - Wind

### Wind

Here you can switch on/off the wind calculation in straight flight. The wind calculation in straight flight can only work, if an external source delivers True Heading and IAS (Indicated Air Speed) resp. TAS (True Air Speed) next to the GPS data. Such a device is e.g. a XC-Variometer together with a compass modul.

#### Ebable wind calculation in straight flight

Activate the check box, if the wind calculation in straight flight shall be executed.

#### Minimal air speed

Define the minimal airspeed, which must be fulfilled, that the wind calculation in straight flight is executed. If it is to low, the wind calculation is not started or the running wind calculation cycle is finished.

#### Speed toleranz

Define the speed tolerance window, which must be fulfilled, that the wind calculation in straight flight is executed. If it is left, the wind calculation cycle is finished.

#### Course/Heading tolerance

Define the course/heading tolerance window, which must be fulfilled, that the wind calculation in straight flight is executed. If it is left, the wind calculation cycle is finished.

#### Wind after

Define the time in seconds after which the wind calculation starts working. So long the speed and tolerance conditions are fulfilled, the wind is calculated after each second.