

---

# **Enroute Flight Navigation**

***Release 2.2.4***

**Stefan Kebekus**

**May 17, 2021**



## Getting started

<b>1</b>	<b>Think before you fly</b>	<b>3</b>
1.1	Software limitations . . . . .	4
1.2	Navigational data and aviation data . . . . .	4
1.3	Operating system limitations . . . . .	4
1.4	Hardware limitations . . . . .	4
<b>2</b>	<b>Installation and setup</b>	<b>5</b>
2.1	App installation . . . . .	5
2.2	Map download . . . . .	5
2.3	Done. . . . .	6
<b>3</b>	<b>Before your first flight</b>	<b>7</b>
3.1	The moving map . . . . .	7
3.2	Interactive controls . . . . .	9
3.3	Information about airspaces, airfields and other facilities . . . . .	9
3.4	Go flying! . . . . .	10
<b>4</b>	<b>Connect your traffic receiver</b>	<b>11</b>
4.1	Before you connect . . . . .	11
4.2	Connect to the traffic receiver . . . . .	12
4.3	Troubleshooting . . . . .	12
<b>5</b>	<b>Connect your flight simulator</b>	<b>13</b>
5.1	Before you connect . . . . .	13
5.2	Set up your flight simulator . . . . .	14
5.3	Troubleshooting . . . . .	15
<b>6</b>	<b>Make a donation</b>	<b>17</b>
<b>7</b>	<b>Map Data</b>	<b>19</b>
<b>8</b>	<b>Other</b>	<b>21</b>
8.1	Flight mode and ground mode . . . . .	23
<b>9</b>	<b>Airspace Display</b>	<b>25</b>
9.1	Controlled Airspace . . . . .	26
9.2	Control Zone . . . . .	26

9.3	Transponder Mandatory Zones . . . . .	27
9.4	Radio Mandatory Zone . . . . .	27
9.5	Parachute Jumping Areas . . . . .	27
9.6	Nature Reserve Areas . . . . .	27
9.7	Airfields . . . . .	29
9.8	Approach and Departure Routes . . . . .	29
<b>10</b>	<b>Weather</b>	<b>31</b>
<b>I</b>	<b>Appendix</b>	<b>35</b>
<b>11</b>	<b>Software license</b>	<b>37</b>
<b>12</b>	<b>Third party software and data</b>	<b>49</b>
12.1	Geographic maps . . . . .	49
12.2	Software and data included in the program . . . . .	49
<b>13</b>	<b>Technical Notes</b>	<b>55</b>
13.1	Platform notes . . . . .	55
13.2	Traffic Receiver . . . . .	55



**Enroute Flight Navigation** is a free flight navigation app for Android and other devices. Designed to be simple, functional and elegant, it takes the stress out of your next flight. The program has been written by flight enthusiasts, as a project of [Akaflieg Freiburg](https://akaflieg-freiburg.de/)<sup>1</sup>, a flight club based in Freiburg, Germany.

**Enroute Flight Navigation** features a moving map, similar in style to the official ICAO maps. Your current position and your flight path for the next five minutes are marked, and so is your intended flight route. A double tap on the display gives you all the information about airspaces, airfields and navaids – complete with frequencies, codes, elevations and runway information.

The free aeronautical maps can be downloaded for offline use. In addition to airspaces, airfields and navaids, selected maps also show traffic circuits as well as flight procedures for control zones. The maps receive near-weekly updates and cover large parts of the world.

**Enroute Flight Navigation** includes flight weather data downloaded from the [NOAA - Aviation Weather Center](https://www.aviationweather.gov/)<sup>2</sup>.

While **Enroute Flight Navigation** is no substitute for full-featured flight planning software, it allows you to quickly and easily compute distances, courses and headings, and gives you an estimate for flight time and fuel consumption. If the weather turns bad, the app will show you the closest airfields for landing, complete with distances, directions, runway information and frequencies.

---

<sup>1</sup> <https://akaflieg-freiburg.de/>

<sup>2</sup> <https://www.aviationweather.gov/>



## Think before you fly

**Enroute Flight Navigation** is a free software product that has been published in the hope that it might be useful as an aid to prudent navigation. It comes with no guarantees. It may not work as expected. Data shown to you might be wrong. Your hardware may fail.

This app is no substitute for proper flight preparation or good pilotage. Any information **must always** be validated using an official navigation and airspace data source.

**Warning:** Always use official flight navigation data for flight preparation and navigate by officially authorized means. The use of non-certified navigation devices and software like **Enroute Flight Navigation** as a primary source of navigation may cause accidents leading to loss of lives.

We do not believe that the use of **Enroute Flight Navigation** fulfills the requirement of the EU Regulation No 923/2012:SER.A.2010<sup>3</sup>

Before beginning a flight, the pilot-in-command of an aircraft shall become familiar with all available information appropriate to the intended operation.

To put it simply: relying on **Enroute Flight Navigation** as a primary means of navigation is most likely illegal in your jurisdiction. It is most certainly stupid and potentially suicidal.

---

<sup>3</sup> <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:281:0001:0066:EN:PDF>

## 1.1 Software limitations

**Enroute Flight Navigation** is not an officially approved flight navigation software. It is not officially approved or certified in any way. The software comes with no guarantee and might contain bugs.

## 1.2 Navigational data and aviation data

Navigational- and aviation data, including airspace and airfield information, are provided “as is” and without any guarantee, official validation, certification or warranty. The data does not come from official sources. It might be incomplete, outdated or otherwise incorrect.

## 1.3 Operating system limitations

We expect that most users will run the software on mobile phones or tablet computers running the Android operating system. Android is not officially approved or certified for aviation. While we expect that the app will run fine for the vast majority of Android users, please keep the following in mind.

- The Android operating system can decide at any time to terminate **Enroute Flight Navigation** or to slow it down to clear resources for other apps.
- Other apps might interfere with the operation of **Enroute Flight Navigation**.
- Many hardware vendors, most notably One Plus, Huawei and Samsung equip their phone with “battery saving apps” that randomly kill long-running processes. These apps cannot be uninstalled by the users, do not comply with Android standards and are often extremely buggy. At times, users can manually exempt apps from “battery saving mode”, but the settings are usually lost on system updates. Google’s own “Pixel” and “Nexus” devices do not have these problems. See the website [Don’t kill my app](https://dontkillmyapp.com)<sup>4</sup> for more information.

## 1.4 Hardware limitations

**Enroute Flight Navigation** runs on a variety of hardware platforms, but we expect that most users will run the software on mobile phones, tablet computers and comparable consumer electronic devices that are not certified to meet aviation standards. Keep the following in mind.

- Your device might not be designed to operate continuously for extended periods of time, in particular if the display is on.
- Your device can overheat. Batteries can catch fire.
- Battery capacity is limited. Even if your device is connected to power via a USB cable, the display and/or CPU might use more energy than USB can deliver.

---

<sup>4</sup> <https://dontkillmyapp.com>



## Installation and setup

### 2.1 App installation

**Installation on Android devices** **Enroute Flight Navigation** is available as an Android App in the [Google Play Store](#)<sup>5</sup>.

An unofficial version of the app is also available at [F-Droid](#)<sup>6</sup>. While the author of **Enroute Flight Navigation** endorses publication at F-Droid, he has not tested this unofficial app for quality.

**Installation on Linux desktop machines** **Enroute Flight Navigation** is available for free download at [flathub.org](#)<sup>7</sup> and [snapcraft.io](#)<sup>8</sup>. Most likely you will also find the app in the software management application on your computer.

After installation, start the app. Depending on the platform, you might need to grant the necessary permissions. You will be asked to accept the terms and conditions.

### 2.2 Map download

**Enroute Flight Navigation** cannot be used without geographic maps. Two types of maps need to be installed for every region where you fly.

- Aeronautical maps. These contain airspaces, airfields and nav aids. Some maps also contain reporting points, airfield traffic circuits and control zone entry/exit routes.
- Base maps. These contain geographic data, such as rivers, roads, railroads and land use.

Follow these steps to install the maps that you need.

- Open the Menu by touching the menu button in the upper right side of the screen. The button is marked with the symbol ‘≡’.
- Choose the menu item *Library*, then *Maps*. The map management page will then open.
- On the map management page, click or tap on the desired maps. The maps will be downloaded and installed on your device.

---

<sup>5</sup> [https://play.google.com/store/apps/details?id=de.akaflieg\\_freiburg.enroute](https://play.google.com/store/apps/details?id=de.akaflieg_freiburg.enroute)

<sup>6</sup> [https://f-droid.org/de/packages/de.akaflieg\\_freiburg.enroute/](https://f-droid.org/de/packages/de.akaflieg_freiburg.enroute/)

<sup>7</sup> [https://flathub.org/apps/details/de.akaflieg\\_freiburg.enroute](https://flathub.org/apps/details/de.akaflieg_freiburg.enroute)

<sup>8</sup> <https://snapcraft.io/enroute-flight-navigation>

Please download only those maps that you will actually need. The infrastructure and bandwidth for map downloads is kindly sponsored by the University of Freiburg, under the assumption that the cost stays within reasonable limits. You will also find that the app performs much better if it does not have to process many megabytes of map data.

---

**Note:** Do not forget that you need aeronautical maps **and** base maps for the desired area of flight. The base maps are large. Make sure that you have a good internet connection before you download maps. It might be inadvisable to download base maps via the mobile phone network.

---

## 2.3 Done.

Once the map download has finished, **Enroute Flight Navigation** will process the map data and update the map display after a minute or so. Tap or click on the arrow symbol ‘←’ or use the Android ‘Back’ button to leave the map page and return to the main screen.

You are now ready to go. There are many things that you could set up at this stage, but we recommend that you simply look around any play with the app. Continue with the next section and take it for your first flight.

## Before your first flight

Now you are ready for the first use of **Enroute Flight Navigation**. General operation is very intuitive. Still, we recommend that you take a minute to make yourself familiar with the moving map display and with the basic controls before you take the app on its first flight.

### 3.1 The moving map

After startup, the app will show a moving map, similar in style to the standard ICAO maps that most pilots are used to. You can use the standard gestures to zoom and pan the map to your liking. The figures *Moving map display on the ground* and *Moving map display in flight* shows how the map will typically look.

Initially, your own position is shown as a blue circle (or gray if the system has not yet acquired a valid position). Once you are moving, your own position is shown as a blue arrow shape. The flight path vector shows the projected track for the next five minutes.

The bottom of the display shows a little panel with the following information.

T.TALT	True altitude (=geometric altitude) above sea level.
FL	Flight level.
GS	Ground speed.
TT	True track.
UTC	Current time.

The flight level is only available if your device is connected to a traffic receiver (such as a PowerFLARM device) that reports the pressure altitude. Flight level and current time are hidden if the display is not wide enough.

**Warning:** Vertical airspace boundaries are defined by pressure altitudes (with respect to QNH or standard pressure). Depending on temperature and air density, the pressure altitude will differ from the true altitude that is shown by the app. **Never use true altitude to judge vertical distances to airspaces.**








Fig. 1: Moving map display on the ground



Fig. 2: Moving map display in flight

### 3.2 Interactive controls

In addition to the pan and pinch gestures, you can use the following buttons to control the app.

	Open main menu
	Switch between display modes <b>north up</b> and <b>track up</b> .
	Center map about own position.
	Zoom in
	Zoom out

### 3.3 Information about airspaces, airfields and other facilities

Double tap or tap-and-hold anywhere in the map to obtain information about the airspace situation at that point. If you double tap or tap-and-hold on an airfield, navaid or reporting point, detailed information about the facility will be shown. The figure *Information about Stuttgart airport* shows how this will typically look.

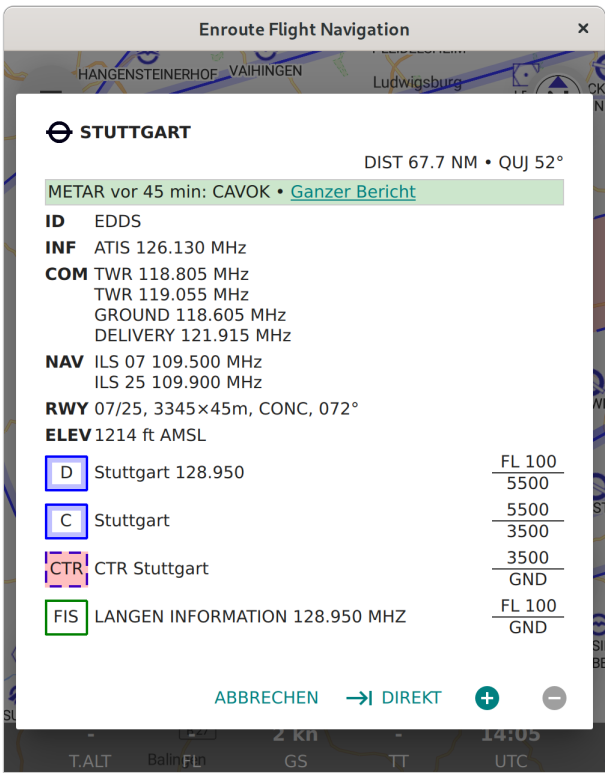


Fig. 3: Information about Stuttgart airport

## 3.4 Go flying!

**Enroute Flight Navigation** is designed to be simple. We think that you are now ready to take **Enroute Flight Navigation** on its first flight. There are of course many more things that you can do. Play with the app and have a look at the next section *Further Steps*.

## Connect your traffic receiver

In order to display nearby traffic on the moving map, **Enroute Flight Navigation** can connect to your aircraft's traffic receiver (typically a FLARM device). In order to show only relevant information, **Enroute Flight Navigation** will not display traffic more than 1,500 m above or below the own position.

The app author has tested the **Enroute Flight Navigation** with the following traffic receivers.

- [AT-1 AIR Traffic](#)<sup>9</sup> by [Air Avionics](#)<sup>10</sup> with software version 5.

Users reported success with the following traffic receivers.

- [Stratux devices](#)<sup>11</sup>
- [TTGO T-Beam devices](#)<sup>12</sup>

---

**Note:** To show only relevant traffic, **Enroute Flight Navigation** will display traffic factors only if the vertical distance is less than 1.500m and the horizontal distance less than 20km.

---

### 4.1 Before you connect

Before you try to connect this app to your traffic receiver, make sure that the following conditions are met.

- Your traffic receiver has an integrated Wi-Fi interface that acts as a wireless access point. Bluetooth devices are currently not supported.
- You know the network name (=SSID) of the Wi-Fi network deployed by your traffic receiver. If the network is encrypted, you also need to know the Wi-Fi password.
- Some devices require an additional password in order to access traffic data. This is currently **not** supported. Set up your device so that no additional password is required.

---

<sup>9</sup> [http://www.air-avionics.com/?page\\_id=253](http://www.air-avionics.com/?page_id=253)

<sup>10</sup> <http://www.air-avionics.com/>

<sup>11</sup> <http://stratux.me/>

<sup>12</sup> <https://www.amazon.de/TTGO-T-Beam-915Mhz-Wireless-Bluetooth/dp/B07SFVQ3Z8>

## 4.2 Connect to the traffic receiver

It takes two steps to connect **Enroute Flight Navigation** to the traffic receiver for the first time. Once things are set up properly, your device should automatically detect the traffic receiver's Wi-Fi network, enter the network and connect to the traffic data stream whenever you go flying.

### 4.2.1 Step 1: Enter the traffic receiver's Wi-Fi network

- Make sure that the traffic receiver has power and is switched on. In a typical aircraft installation, the traffic receiver is connected to the 'Avionics' switch and will automatically switch on. You may need to wait a minute before the Wi-Fi comes online and is visible to your device.
- Enter the Wi-Fi network deployed by your traffic receiver. This is usually done in the "Wi-Fi Settings" of your device. Enter the Wi-Fi password if required. Some devices will issue a warning that the Wi-Fi is not connected to the internet. In this case, you might need to confirm that you wish to enter the Wi-Fi network.

Most operating systems will offer to remember the connection, so that your device will automatically connect to this Wi-Fi in the future. We recommend using this option.

### 4.2.2 Step 2: Connect to the traffic data stream

Open the main menu and navigate to the "Information" menu.

- If the entry "Traffic Receiver" is highlighted in green, then **Enroute Flight Navigation** has already found the traffic receiver in the network and has connected to it. Congratulations, you are done!
- If the entry "Traffic Receiver" is not highlighted in green, then select the entry. The "Traffic Receiver Status" page will open. The page explains the connection status in detail, and explains how to establish a connection manually.

## 4.3 Troubleshooting

### The app cannot connect to the traffic data stream.

- Check that your device is connected to the Wi-Fi network deployed by your traffic receiver.

### The connection breaks down after a few seconds.

Most traffic receivers cannot serve more than one client and abort connections at random if more than one device tries to access.

- Make sure that there no second device connected to the traffic receiver's Wi-Fi network. The other device might well be in your friend's pocket!
- Make sure that there is no other app trying to connect to the traffic receiver's data stream.
- Many traffic receivers offer "configuration panels" that can be accessed via a web browser. Close all web browsers.



## Connect your flight simulator

**Enroute Flight Navigation** can connect to flight simulator software. The app has been tested with the following programs.

- X-Plane 11<sup>13</sup>

Users have reported success with the following programs.

- X-Plane 10<sup>14</sup>

Please contact us if you are aware of other programs that also work.

---

**Note:** **Enroute Flight Navigation** treats flight simulators as traffic receivers. To see the connection status, open the main menu and navigate to the “Information” menu.

---

### 5.1 Before you connect

This manual assumes a typical home setup, where both the computer that runs the flight simulator and the device that runs **Enroute Flight Navigation** are connected to a Wi-Fi network deployed by a home router. Make sure that the following conditions are met.

- The computer that runs the flight simulator and the device that runs **Enroute Flight Navigation** are connected to the same Wi-Fi network. Some routers deploy two networks, often called “main network” and a “guest network”.
- Make sure that the router allows data transfer between the devices in the Wi-Fi network. Some routers have “security settings” that disallow data transfer between the devices in the “guest network”

---

<sup>13</sup> <https://www.x-plane.com/>

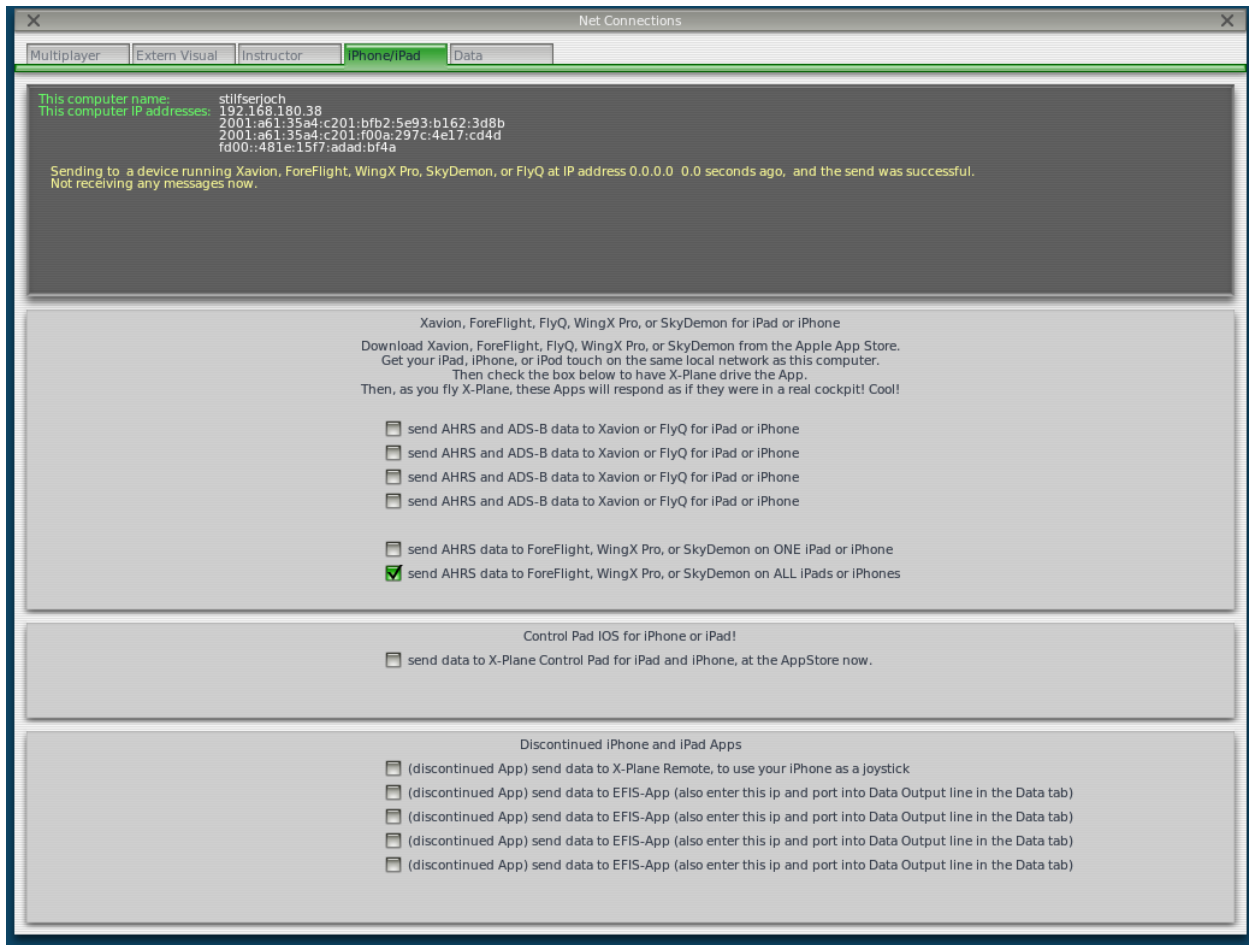
<sup>14</sup> <https://www.x-plane.com/>

## 5.2 Set up your flight simulator

Your flight simulation software needs to broadcast position and traffic information over the Wi-Fi network. Once this is done, there is no further setup required. As soon as the flight simulator starts to broadcast information over the Wi-Fi network, the moving map of **Enroute Flight Navigation** will adjust accordingly. To end the connection to the flight simulator, simply leave the flight simulator's Wi-Fi network.

### 5.2.1 X-Plane 10

Follow the explanation on [this page](#)<sup>15</sup>, which explains how to connect X-Plane 10 to the commercial app ForeFlight. In short: Open the “Settings” window and click “Internet Options”. There, go to the “iPhone/iPod” tab and turn on the “ForeFlight” option. Please be sure to disable output of data on tab “Data”.



<sup>15</sup> <https://www.x-plane.com/2012/08/foreflight-charts-supported-in-x-plane-10-10-beta-9/>

## 5.2.2 X-Plane 11

Open the “Settings” window and choose the “Network” tab. Locate the settings group “This machine’s role” on the right-hand side of the tab. Open the section “iPHONE, iPAD, and EXTERNAL APPS” and select the item “Broadcast to all mapping apps on the network” under the headline “OTHER MAPPING APPS”.



## 5.2.3 MS Flight Simulator

UNKNOWN AS OF NOW.

## 5.2.4 Other programs

The flight simulator needs to be set up to send UDP datagrams in one of the standard formats “GDL90” or “XGPS” to ports 4000 or 49002. Given the choice, GDL90 is generally the preferred format.

## 5.3 Troubleshooting

**Enroute Flight Navigation** treats flight simulators as traffic receivers. To see the connection status, open the main menu and navigate to the “Information” menu. If the entry “Traffic Receiver” is highlighted in green, then **Enroute Flight Navigation** has already found the program in the network and has connected to it. If not, then select the entry. The “Traffic Receiver Status” page will open, which explains the connection status in more detail.



## Make a donation

**Enroute Flight Navigation** is a non-commercial project of [Akaflieg Freiburg](https://akaflieg-freiburg.de/)<sup>16</sup> and the [University of Freiburg](https://uni-freiburg.de/en/)<sup>17</sup>. The app has been written by flight enthusiasts in their spare time, as a service to the community. The developers do not take donations.

If you appreciate the app, please consider a donation to Akaflieg Freiburg, a tax-privileged, not-for-profit flight club of public utility in Freiburg, Germany.

IBAN:	DE35 6809 0000 0027 6409 07
BIC:	GENODE61FR1
Bank:	Volksbank Freiburg
Message:	Enroute Flight Navigation

---

<sup>16</sup> <https://akaflieg-freiburg.de/>

<sup>17</sup> <https://uni-freiburg.de/en/>



## Map Data

The Information displayed by the Map of Enroute Flight Navigation is provided by the following resources:

- openAIP
- open flightmaps
- Map Tiler
- Open Street Map

**To get more detailed Information on these Resources you may touch the link on the lower edge of the map Display Map Data Co**

- <https://www.openaip.net>
- <https://www.openflightmaps.org>
- <https://www.maptiler.com>
- <https://www.openstreetmap.org>

### Open AIP

Open AIP has the goal to deliver free, current and precise data for air navigation to everyone. Open AIP is a web based and crowd-sourced platform. The Open AIP provides the basic source aeronautical data for display in Enroute Flight Navigation.

### Open Flight Maps

Open Flight Maps is an open-source project providing aeronautical data for a high quality VFR Map. Open Flight Maps is providing some additional information, where available.

The detailed split of the data sources for the Enroute Flight Navigation map is shown below:

Map Feature	Data Origin
Airfields	openAIP
Airspace: Nature Preserve Areas	open flightmaps
Airspace: all other	openAIP
Nav aids	openAIP
Procedures (Traffic Circuits, ...)	open flightmaps
Reporting Points	open flightmaps

### Map Tiler

Is a software application to combine multiple layers of data for maps and provide the map in a format for loading and display. The Enroute Flight Navigation base maps are edited versions of maps kindly provided by Klokan Technologies through the OpenMapTiles project.

### **Open Street Map**

Open Street Map (OSM) is a collaborative project to create a free editable map of the world. The geodata underlying the map is considered the primary output of the project. The creation and growth of OSM has been motivated by restrictions on use or availability of map data across much of the world, and the advent of inexpensive portable satellite navigation devices. The Open Street Map data is used to create the base maps.



The Map display is composed of two layers selected in the respective Tabs of the 'Map Library' screen:

- Aeronautical Map
- Base Map

### **Aeronautical Maps**

The Aeronautical Map layers is showing the airspace data on the Map screen. If no Base Map is installed for the area only the information coming from the Aviation Map data is displayed.

The Aeronautical Map contains:

- Airfields
- Airspace boundaries
- Nav aids
- Reporting points and routes (if available)

The display used for aerospace data is using the following basic color scheme:

- **Red:**
  - Line with shadow inside for Restricted Airspace
  - Shadow with dashed blue border for Aerodrome Control Zone (CTR)
  - Dashed Line for Parachute Jumping Exercise area
  - Line for Glider or Microlight Traffic pattern
- **Blue:**
  - Line with shadow for controlled airspace (A, B, C, D)
  - Shadow with dashed blue border for Radio Mandatory Zone (RMZ)
  - Airport, reporting point or Navaid symbols
  - For Route or Traffic Pattern for powered aircraft
- **Green:**
  - Line with shadow for Natural Reserve Area (NRA)
  - Line for airspace control sector boundaries

- Black:
  - Dashed Line for Transponder Mandatory Zone (TMZ)

### Class 1 and Class 2 maps:

- Class 1 maps are compiled from openAIP and open flightmaps data. These maps contain complete information about airspaces, airfields and nav aids. In addition, the maps contain (mandatory) reporting points. Some of our tier 1 maps also show traffic circuits and flight procedures for control zones.
- Class 2 maps are compiled from openAIP data only. They contain complete information about airspaces, airfields and nav aids.

Details on the maps may be found at <<https://akaflieg-freiburg.github.io/enroute/maps/>> The Aeronautical Map data is selected on the “Map Library” – “Aviation Data” page accessed via the “Settings” Menu. To update the list of available maps the “...” option in the upper right corner of the screen may be used. You may install or uninstall the aviation Map data for a county by the selection on the right hand side of the country list. To find a country you have to scroll up and down in the list.

---

**Note:** To have optimum presentation of the **Enroute Flight Navigation** map display install the Aviation Map and the Base Map for all areas you intend to use **Enroute Flight Navigation**.

---

**Caution:** No airspace information will be provided in country when the Aeronautical Map is not installed for it.

---

**Note:** **Enroute Flight Navigation** will automatically check for updated Maps on the Enroute server and show a pop-up window after start if updated maps have been detected. You will be asked if you want to update the map or delay the update.

---

### Base Map

The Base Map layers is showing the geographic data on the Map screen. If no Base Map is shown for an area it will be shown in the white background color. If no Aviation Map is installed for the area only the information coming from the Base Map data is displayed. The Base Map is organized in tiles. This will result in not stopping the Base Map display abruptly at the border of an installed country, but showing some overlap. The Base Map will show:

- Landmass
- Water Surface (oceans, lakes and rivers)
- Forests
- Main Roads
- Railroad lines
- City names

---

**Note:** To have optimum presentation of the **Enroute Flight Navigation** map display install the Aeronautical Map and the Base Map for all areas you intend to use **Enroute Flight Navigation**.

---

---

**Note:** **Enroute Flight Navigation** will not show most cultural build ups and limits or settled area boundaries to reduce the map size.

---

## **8.1 Flight mode and ground mode**

### **Ground Mode**

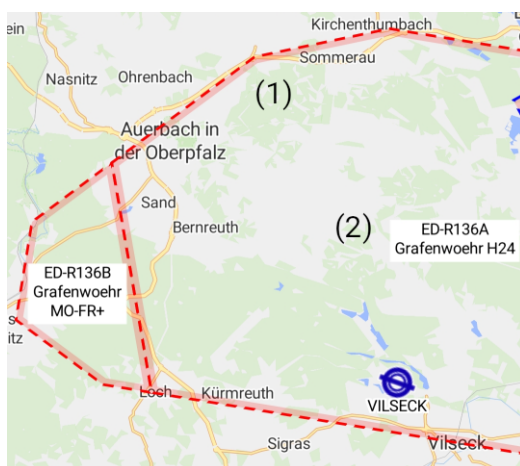
Ground Mode is displayed by **Enroute Flight Navigation** whenever the sensed speed is below the threshold and the Menu item 'Automatic Flight Detection' is not set to 'Always in Flight Mode'. Ground Mode does not display the Flight Data line at the lower end of the screen and is intended for flight planning.



## Airspace Display

The display of airspace will generally follow the common ICAO symbology. Restricted Airspace Restricted airspace will be surrounded by an intense red dashed line and a thick transparent red line inside the restricted area boundaries. When selecting a point inside the restricted area by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits
- Area activation time



*Legend:*

1. Outline of Restricted Airspace
2. Designation and activation time of airspace

## 9.1 Controlled Airspace

All boundaries of controlled airspace are shown by a solid blue line and a thick transparent blue line inside the airspace. Figure 13: Controlled Airspace When selecting a point inside the controlled airspace by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits

**Caution:** All controlled airspace (Class A – Class D) are shown in the same way even if different restrictions or ATC clearance requirements may be present.

## 9.2 Control Zone

The Control Zone of an airport is shown with a dashed blue line filled in transparent red color. Figure 13: Controlled Airspace When selecting a point inside the Control Zone (CTR) by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits



*Legend:*

1. Airport ICAO Symbol
2. Airport Control Zone (CTR)
3. Radio Mandatory Zone (RMZ)
4. Boundary of Controlled Airspace
5. Restricted Airspace

## 9.3 Transponder Mandatory Zones

Transponder Mandatory Zones (TMZ) are shown with a black dashed outline. When selecting a point inside the Transponder Mandatory Zone (TMZ) by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits
- Monitoring Frequency
- Mode 3 Squawk

## 9.4 Radio Mandatory Zone

Radio Mandatory Zones (RMZ) are shown with a solid blue dashed outline and filled in transparent blue. When selecting a point inside the Radio Mandatory Zone (RMZ) by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits
- Radio Frequency

## 9.5 Parachute Jumping Areas

Parachute Jumping Exercise areas (PJE) are shown with a solid red dashed outline. When selecting a point inside the PJE by double touching the screen the information to the related area is given with the waypoint pop-up window:

- Area Name
- Area altitude limits
- Radio Frequency

## 9.6 Nature Reserve Areas

Nature Reserve Areas (NRA) are shown with a solid green outline. When selecting a point inside the NRA by double touching the screen the information to the related area is given with the waypoint pop-up window:

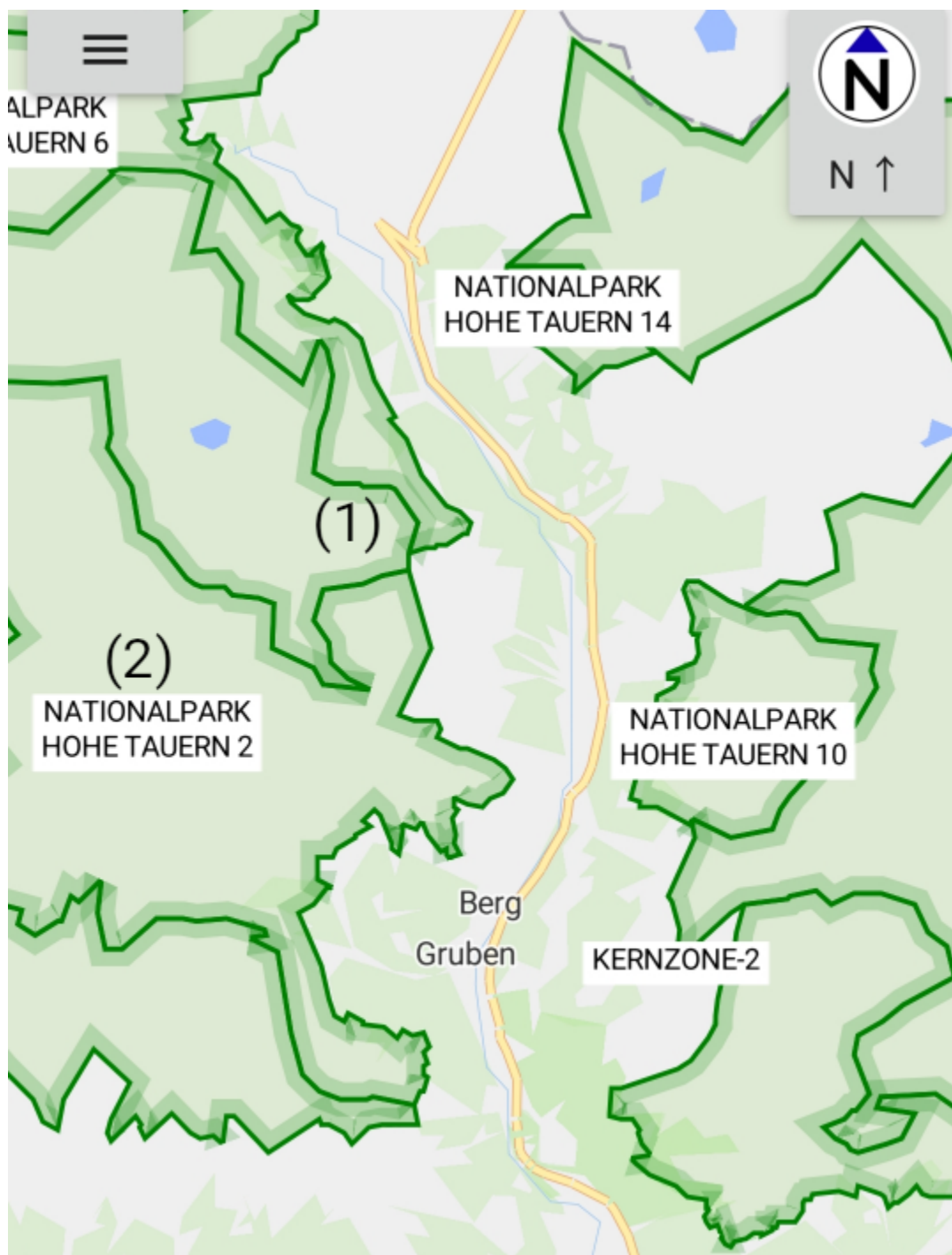
- Area Name
- Area altitude limits

**Caution:** Check restrictions applicable for flying inside NRA when planning your flight. For example in Austria high fines are applicable when flying inside NRA.

Figure 14: Nature Reserve Area

*Legend:*

1. Outline of Nature Reserve Area (NRA)





## 2. Designation of NRA

### 9.7 Airfields

The symbology used to display airfields follows the ICAO rules. Airfield Information When selecting an airfield by double touching the screen the related information is given in a pop-up window:

- Airfield Name and Identifier
- Radio Frequency including COM and Information frequencies
- Navaid frequencies
- Runway orientation, dimensions and surface
- Field elevation
- Data for associated airspace

### 9.8 Approach and Departure Routes

Approach routes to airfields are shown as solid blue lines. The designation of the route is written along the paths. The associated reporting points are shown as blue triangles with a dashed circle and the reporting point designation. Approach Routes will be shown by a solid line and Departure Routes will be shown as dashed lines. Note Approach Routes will only be displayed when zooming into the area. Traffic Pattern Traffic pattern for motorized aircraft are shown as blue lines. Traffic circuits for gliders or Ultralight aircraft are shown as red lines. Entry and exit routes to traffic pattern are indicated by open ends of the pattern. The traffic circuit will show the traffic circuit altitude when the information is available. Note Traffic pattern will only be displayed when zooming into the area.



The Weather page is opened via the Menu by touching the “Weather” entry. The Weather page will display the station overview list for all currently available meteorological reports within 200 NM of the current position.

*Legend:*

1. Weather Menu
2. Station data
3. Meteorological data closest to own position

The weather data is downloaded from the National Weather Service of the United States of America.

---

**Note:** When opening the Weather page the first time you will have to confirm that you agree to download data from the NWS server to use this service.

---

The menu of the Weather page will allow to:

- Update the METAR and TAF data
- Disallow the internet connection

The Weather overview window will provide the following information based on the METAR:

- ICAO identifier for Station and Airport name
- Distance and magnetic Bearing to Airport
- Time of METAR and summary weather state

On the lower end of the weather page the following data relevant to your current position will be displayed:

- QNH
- Location and time of the report the QNH was extracted
- Sunset during day or Sunrise during night at current location
- Remaining time until sunset or sunrise

The information of each airport will be color coded by a system established by the US National Weather Service. The coding scheme is explained in the table below. When touching a station line METAR and TAF (if available) will be shown in a weather detail sub-page

*Legend:*

 **Weather** (1) ⋮

 **EDDS**  
STUTT GART  
DIST 62.6 NM • QUJ 224°  
METAR 8min ago: CAVOK

(2)

 **ETIC**  
GRAFENWÖHR  
DIST 64.8 NM • QUJ 76°  
METAR 32min ago: low IMC

 **ETSI**  
INGOLSTADT/MANCHING  
DIST 65.0 NM • QUJ 132°  
METAR 8min ago: low IMC • fog

 **EDMA**  
AUGSBURG  
DIST 65.7 NM • QUJ 158°  
METAR 8min ago: low IMC • fog

 **EDFM**  
MANNHEIM CITY  
DIST 70.6 NM • QUJ 272°  
METAR 38min ago: marginal VMC

 **ETHL**  
LAUPHEIM  
DIST 75.3 NM • QUJ 193°  
METAR 1h and 8min ago: low IMC • fog

**EDDF**

 QNH: 1026 hPa in ETIK, 1h and 31min ago  
 SR tomorrow 6:22, in 10h and 55min (3)

 **STUTTGART**

(1)

DIST 62.6 NM • QUJ 224°

**METAR 12min ago**EDDS 091920Z 26003KT CAVOK 07/06  
Q1025 NOSIG

(2)

Report for EDDS

Issued at 19:20

(3)

Wind direction 260°, wind speed 3 kt

CAVOK

Temperature 7 °C, Dew point 6 °C, Humidity  
93%

QNH: 1025 hPa

No significant weather changes expected

**TAF**TAF EDDS 091700Z 0918/1018 VRB02KT  
CAVOK TEMPO 0918/0921 3000 BR BECMG  
0921/0924 0500 FG OVC001 PROB40  
TEMPO 1000/1010 0150 FG BECMG  
1010/1012 6000 BKN006

(4)

Report type: TAF

Report for EDDS

(5)

Issued at 17:00

**Forecast from 18:00 to tomorrow 18:00**

Wind direction variable, wind speed 2 kt

CAVOK

**Temporarily from 18:00 until 21:00**

Visibility is 3000 m

mist

Close

1. Station data including bearing and distance
2. Current meteorological report
3. Decoded view of Current meteorological report
4. Weather forecast for station
5. Decoded view of weather forecast

---

**Note:** To view the full weather forecast you have to scroll down in most cases

---

<p><b>Caution:</b> The color coding used for station weather does not match to European VFR criteria. Assessment of meteorological flight conditions has to be done via an officially approved source of flight weather.</p>
--

Category	Color	Ceiling		Visibility
IFR Instrument Flight Rules	Red	500 to below 1,000 feet AGL	and /or	1 mile to less than 3 miles
MVFR Marginal Visual Flight Rules	Yellow	1,000 to 3,000 feet AGL	and /or	3 to 5 miles
VFR Visual Flight Rules	Green	greater than 3,000 feet AGL	and /or	greater than 5 miles

---

**Note:** By definition, IFR is ceiling less than 1,000 feet AGL.

---

---

**Note:** By definition, VFR is ceiling greater than or equal to 3,000 feet AGL and visibility greater than or equal to 5 miles while MVFR is a sub-category of VFR.

---

## **Part I**

# **Appendix**





The program **Enroute Flight Navigation** is licensed under the [GNU General Public License V3<sup>18</sup>](https://www.gnu.org/licenses/gpl-3.0-standalone.html) or, at your choice, any later version of this license.

#### GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

Copyright © 2007 Free Software Foundation, Inc. <<https://fsf.org/>>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

#### Preamble

The GNU General Public License is a free, copyleft license for software and other kinds of works.

The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change all versions of a program--to make sure it remains free software for all its users. We, the Free Software Foundation, use the GNU General Public License for most of our software; it applies also to any other work released this way by its authors. You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs, and that you know you can do these things.

To protect your rights, we need to prevent others from denying you these rights or asking you to surrender the rights. Therefore, you have certain responsibilities if you distribute copies of the software, or if you modify

(continues on next page)

<sup>18</sup> <https://www.gnu.org/licenses/gpl-3.0-standalone.html>

(continued from previous page)

it: responsibilities to respect the freedom of others.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

Developers that use the GNU GPL protect your rights with two steps: (1) assert copyright on the software, and (2) offer you this License giving you legal permission to copy, distribute and/or modify it.

For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

## TERMS AND CONDITIONS

### 0. Definitions.

“This License” refers to version 3 of the GNU General Public License.

“Copyright” also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

“The Program” refers to any copyrightable work licensed under this License. Each licensee is addressed as “you”. “Licensees” and “recipients” may be individuals or organizations.

To “modify” a work means to copy from or adapt all or part of the work in a

(continues on next page)

(continued from previous page)

fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a "modified version" of the earlier work or a work "based on" the earlier work.

A "covered work" means either the unmodified Program or a work based on the Program.

To "propagate" a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the public, and in some countries other activities as well.

To "convey" a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays "Appropriate Legal Notices" to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

#### 1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The "System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or

(continues on next page)

(continued from previous page)

general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source.

The Corresponding Source for a work in source code form is that same work.

## 2. Basic Permissions.

All rights granted under this License are granted for the term of copyright on the Program, and are irrevocable provided the stated conditions are met. This License explicitly affirms your unlimited permission to run the unmodified Program. The output from running a covered work is covered by this License only if the output, given its content, constitutes a covered work. This License acknowledges your rights of fair use or other equivalent, as provided by copyright law.

You may make, run and propagate covered works that you do not convey, without conditions so long as your license otherwise remains in force. You may convey covered works to others for the sole purpose of having them make modifications exclusively for you, or provide you with facilities for running those works, provided that you comply with the terms of this License in conveying all material for which you do not control copyright. Those thus making or running the covered works for you must do so exclusively on your behalf, under your direction and control, on terms that prohibit them from making any copies of your copyrighted material outside their relationship with you.

Conveying under any other circumstances is permitted solely under the conditions stated below. Sublicensing is not allowed; section 10 makes it unnecessary.

## 3. Protecting Users' Legal Rights From Anti-Circumvention Law.

No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures.

When you convey a covered work, you waive any legal power to forbid circumvention of technological measures to the extent such circumvention is effected by exercising rights under this License with respect to the covered work, and you disclaim any intention to limit operation or modification of the work as a means of enforcing, against the work's users, your or third parties' legal rights to forbid circumvention of technological measures.

(continues on next page)

(continued from previous page)

#### 4. Conveying Verbatim Copies.

You may convey verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice; keep intact all notices stating that this License and any non-permissive terms added in accord with section 7 apply to the code; keep intact all notices of the absence of any warranty; and give all recipients a copy of this License along with the Program.

You may charge any price or no price for each copy that you convey, and you may offer support or warranty protection for a fee.

#### 5. Conveying Modified Source Versions.

You may convey a work based on the Program, or the modifications to produce it from the Program, in the form of source code under the terms of section 4, provided that you also meet all of these conditions:

- a) The work must carry prominent notices stating that you modified it, and giving a relevant date.
- b) The work must carry prominent notices stating that it is released under this License and any conditions added under section 7. This requirement modifies the requirement in section 4 to "keep intact all notices".
- c) You must license the entire work, as a whole, under this License to anyone who comes into possession of a copy. This License will therefore apply, along with any applicable section 7 additional terms, to the whole of the work, and all its parts, regardless of how they are packaged. This License gives no permission to license the work in any other way, but it does not invalidate such permission if you have separately received it.
- d) If the work has interactive user interfaces, each must display Appropriate Legal Notices; however, if the Program has interactive interfaces that do not display Appropriate Legal Notices, your work need not make them do so.

A compilation of a covered work with other separate and independent works, which are not by their nature extensions of the covered work, and which are not combined with it such as to form a larger program, in or on a volume of a storage or distribution medium, is called an "aggregate" if the compilation and its resulting copyright are not used to limit the access or legal rights of the compilation's users beyond what the individual works permit. Inclusion of a covered work in an aggregate does not cause this License to apply to the other parts of the aggregate.

#### 6. Conveying Non-Source Forms.

You may convey a covered work in object code form under the terms of sections 4 and 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, in one of these ways:

(continues on next page)

(continued from previous page)

- a) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used for software interchange.
- b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.
- c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.
- d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.
- e) Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A “User Product” is either (1) a “consumer product”, which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, “normally used” refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless

(continues on next page)

(continued from previous page)

of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

“Installation Information” for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

If you convey an object code work under this section in, or with, or specifically for use in, a User Product, and the conveying occurs as part of a transaction in which the right of possession and use of the User Product is transferred to the recipient in perpetuity or for a fixed term (regardless of how the transaction is characterized), the Corresponding Source conveyed under this section must be accompanied by the Installation Information. But this requirement does not apply if neither you nor any third party retains the ability to install modified object code on the User Product (for example, the work has been installed in ROM).

The requirement to provide Installation Information does not include a requirement to continue to provide support service, warranty, or updates for a work that has been modified or installed by the recipient, or for the User Product in which it has been modified or installed. Access to a network may be denied when the modification itself materially and adversely affects the operation of the network or violates the rules and protocols for communication across the network.

Corresponding Source conveyed, and Installation Information provided, in accord with this section must be in a format that is publicly documented (and with an implementation available to the public in source code form), and must require no special password or key for unpacking, reading or copying.

## 7. Additional Terms.

“Additional permissions” are terms that supplement the terms of this License by making exceptions from one or more of its conditions. Additional permissions that are applicable to the entire Program shall be treated as though they were included in this License, to the extent that they are valid under applicable law. If additional permissions apply only to part of the Program, that part may be used separately under those permissions, but the entire Program remains governed by this License without regard to the additional permissions.

When you convey a copy of a covered work, you may at your option remove any additional permissions from that copy, or from any part of it. (Additional permissions may be written to require their own removal in certain cases when you modify the work.) You may place additional permissions on material, added by you to a covered work, for which you have or can give appropriate copyright permission.

(continues on next page)

(continued from previous page)

Notwithstanding any other provision of this License, for material you add to a covered work, you may (if authorized by the copyright holders of that material) supplement the terms of this License with terms:

- a) Disclaiming warranty or limiting liability differently from the terms of sections 15 and 16 of this License; or
- b) Requiring preservation of specified reasonable legal notices or author attributions in that material or in the Appropriate Legal Notices displayed by works containing it; or
- c) Prohibiting misrepresentation of the origin of that material, or requiring that modified versions of such material be marked in reasonable ways as different from the original version; or
- d) Limiting the use for publicity purposes of names of licensors or authors of the material; or
- e) Declining to grant rights under trademark law for use of some trade names, trademarks, or service marks; or
- f) Requiring indemnification of licensors and authors of that material by anyone who conveys the material (or modified versions of it) with contractual assumptions of liability to the recipient, for any liability that these contractual assumptions directly impose on those licensors and authors.

All other non-permissive additional terms are considered “further restrictions” within the meaning of section 10. If the Program as you received it, or any part of it, contains a notice stating that it is governed by this License along with a term that is a further restriction, you may remove that term. If a license document contains a further restriction but permits relicensing or conveying under this License, you may add to a covered work material governed by the terms of that license document, provided that the further restriction does not survive such relicensing or conveying.

If you add terms to a covered work in accord with this section, you must place, in the relevant source files, a statement of the additional terms that apply to those files, or a notice indicating where to find the applicable terms.

Additional terms, permissive or non-permissive, may be stated in the form of a separately written license, or stated as exceptions; the above requirements apply either way.

#### 8. Termination.

You may not propagate or modify a covered work except as expressly provided under this License. Any attempt otherwise to propagate or modify it is void, and will automatically terminate your rights under this License

(continues on next page)



(continued from previous page)

(including any patent licenses granted under the third paragraph of section 11).

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, you do not qualify to receive new licenses for the same material under section 10.

#### 9. Acceptance Not Required for Having Copies.

You are not required to accept this License in order to receive or run a copy of the Program. Ancillary propagation of a covered work occurring solely as a consequence of using peer-to-peer transmission to receive a copy likewise does not require acceptance. However, nothing other than this License grants you permission to propagate or modify any covered work. These actions infringe copyright if you do not accept this License. Therefore, by modifying or propagating a covered work, you indicate your acceptance of this License to do so.

#### 10. Automatic Licensing of Downstream Recipients.

Each time you convey a covered work, the recipient automatically receives a license from the original licensors, to run, modify and propagate that work, subject to this License. You are not responsible for enforcing compliance by third parties with this License.

An "entity transaction" is a transaction transferring control of an organization, or substantially all assets of one, or subdividing an organization, or merging organizations. If propagation of a covered work results from an entity transaction, each party to that transaction who receives a copy of the work also receives whatever licenses to the work the party's predecessor in interest had or could give under the previous paragraph, plus a right to possession of the Corresponding Source of the work from the predecessor in interest, if the predecessor has it or can get it with reasonable efforts.

You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License. For example, you may not impose a license fee, royalty, or other charge for exercise of rights granted under

(continues on next page)

(continued from previous page)

this License, and you may not initiate litigation (including a cross-claim or counterclaim in a lawsuit) alleging that any patent claim is infringed by making, using, selling, offering for sale, or importing the Program or any portion of it.

#### 11. Patents.

A “contributor” is a copyright holder who authorizes use under this License of the Program or a work on which the Program is based. The work thus licensed is called the contributor's “contributor version”.

A contributor's “essential patent claims” are all patent claims owned or controlled by the contributor, whether already acquired or hereafter acquired, that would be infringed by some manner, permitted by this License, of making, using, or selling its contributor version, but do not include claims that would be infringed only as a consequence of further modification of the contributor version. For purposes of this definition, “control” includes the right to grant patent sublicenses in a manner consistent with the requirements of this License.

Each contributor grants you a non-exclusive, worldwide, royalty-free patent license under the contributor's essential patent claims, to make, use, sell, offer for sale, import and otherwise run, modify and propagate the contents of its contributor version.

In the following three paragraphs, a “patent license” is any express agreement or commitment, however denominated, not to enforce a patent (such as an express permission to practice a patent or covenant not to sue for patent infringement). To “grant” such a patent license to a party means to make such an agreement or commitment not to enforce a patent against the party.

If you convey a covered work, knowingly relying on a patent license, and the Corresponding Source of the work is not available for anyone to copy, free of charge and under the terms of this License, through a publicly available network server or other readily accessible means, then you must either (1) cause the Corresponding Source to be so available, or (2) arrange to deprive yourself of the benefit of the patent license for this particular work, or (3) arrange, in a manner consistent with the requirements of this License, to extend the patent license to downstream recipients. “Knowingly relying” means you have actual knowledge that, but for the patent license, your conveying the covered work in a country, or your recipient's use of the covered work in a country, would infringe one or more identifiable patents in that country that you have reason to believe are valid.

If, pursuant to or in connection with a single transaction or arrangement, you convey, or propagate by procuring conveyance of, a covered work, and grant a patent license to some of the parties receiving the covered work authorizing them to use, propagate, modify or convey a specific copy of the covered work, then the patent license you grant is automatically extended to all recipients of the covered work and works based on it.

(continues on next page)

(continued from previous page)

A patent license is “discriminatory” if it does not include within the scope of its coverage, prohibits the exercise of, or is conditioned on the non-exercise of one or more of the rights that are specifically granted under this License. You may not convey a covered work if you are a party to an arrangement with a third party that is in the business of distributing software, under which you make payment to the third party based on the extent of your activity of conveying the work, and under which the third party grants, to any of the parties who would receive the covered work from you, a discriminatory patent license (a) in connection with copies of the covered work conveyed by you (or copies made from those copies), or (b) primarily for and in connection with specific products or compilations that contain the covered work, unless you entered into that arrangement, or that patent license was granted, prior to 28 March 2007.

Nothing in this License shall be construed as excluding or limiting any implied license or other defenses to infringement that may otherwise be available to you under applicable patent law.

#### 12. No Surrender of Others' Freedom.

If conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot convey a covered work so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not convey it at all. For example, if you agree to terms that obligate you to collect a royalty for further conveying from those to whom you convey the Program, the only way you could satisfy both those terms and this License would be to refrain entirely from conveying the Program.

#### 13. Use with the GNU Affero General Public License.

Notwithstanding any other provision of this License, you have permission to link or combine any covered work with a work licensed under version 3 of the GNU Affero General Public License into a single combined work, and to convey the resulting work. The terms of this License will continue to apply to the part which is the covered work, but the special requirements of the GNU Affero General Public License, section 13, concerning interaction through a network will apply to the combination as such.

#### 14. Revised Versions of this License.

The Free Software Foundation may publish revised and/or new versions of the GNU General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies that a certain numbered version of the GNU General Public License “or any later version” applies to it, you have the option of following the terms and conditions either of that numbered version or of any later version

(continues on next page)

(continued from previous page)

published by the Free Software Foundation. If the Program does not specify a version number of the GNU General Public License, you may choose any version ever published by the Free Software Foundation.

If the Program specifies that a proxy can decide which future versions of the GNU General Public License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Program.

Later license versions may give you additional or different permissions. However, no additional obligations are imposed on any author or copyright holder as a result of your choosing to follow a later version.

15. Disclaimer of Warranty.

THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. Limitation of Liability.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MODIFIES AND/OR CONVEYS THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

17. Interpretation of Sections 15 and 16.

If the disclaimer of warranty and limitation of liability provided above cannot be given local legal effect according to their terms, reviewing courts shall apply local law that most closely approximates an absolute waiver of all civil liability in connection with the Program, unless a warranty or assumption of liability accompanies a copy of the Program in return for a fee.

## Third party software and data

**Enroute Flight Navigation** builds on a large number of open-source software components and on open-source data.

### 12.1 Geographic maps

As a flight navigation program, **Enroute Flight Navigation** heavily relies on geographic map data. The geographic maps are not included in the program, but are downloaded at runtime. They are compiled from the following sources.

- The base maps are modified data from [OpenMapTiles](#)<sup>19</sup>, published under a [CC-BY 4.0 design license](#)<sup>20</sup>.
- The aviation maps contain data from [openAIP](#)<sup>21</sup>, licensed under a [CC BY-NC-SA license](#)<sup>22</sup>.
- The aviation maps contain data from [open flightmaps](#)<sup>23</sup>, licensed under the [OFMA General Users' License](#)<sup>24</sup>.

### 12.2 Software and data included in the program

Depending on platform and configuration, the following components might be included in the installation of **Enroute Flight Navigation**.

- [Adobe Glyph List For New Fonts](#)<sup>25</sup>. BSD 3-Clause “New” or “Revised” License.
- [ANGLE Library](#)<sup>26</sup>. BSD 3-clause “New” or “Revised” License.
- ANGLE: Array Bounds Clamper for WebKit. BSD 2-clause “Simplified” License.
- ANGLE: Khronos Headers. MIT License.
- ANGLE: Murmurhash. Public Domain.
- ANGLE: Systeminfo. BSD 2-clause “Simplified” License.
- ANGLE: trace\_event. BSD 3-clause “New” or “Revised” License.

<sup>19</sup> <https://github.com/openmaptiles/openmaptiles>

<sup>20</sup> <https://github.com/openmaptiles/openmaptiles/blob/master/LICENSE.md>

<sup>21</sup> <http://www.openaip.net>

<sup>22</sup> <https://creativecommons.org/licenses/by-nc-sa/3.0/>

<sup>23</sup> <https://www.openflightmaps.org/>

<sup>24</sup> <https://www.openflightmaps.org/live/downloads/20150306-LCN.pdf>

<sup>25</sup> <https://github.com/adobe-type-tools/agl-aglfn>

<sup>26</sup> <http://angleproject.org/>

- Anti-aliasing rasterizer from FreeType <sup>27</sup>. Freetype Project License or GNU General Public License v2.0 only.
- Bitstream Vera Font<sup>28</sup>. Bitstream Vera Font License.
- Clip2Tri Polygon Triangulation Library<sup>29</sup>. MIT License.
- Clipper Polygon Clipping Library<sup>30</sup>. Boost Software License 1.0.
- Cocoa Platform Plugin. BSD 3-clause “New” or “Revised” License.
- Cycle. MIT License.
- Data Compression Library (zlib)<sup>31</sup>. zlib License.
- DejaVu Fonts<sup>32</sup>. Bitstream Vera Font License.
- Earcut Polygon Triangulation Library<sup>33</sup>. ISC License.
- Earth Gravitational Model<sup>34</sup>. Public Domain.
- Easing Equations by Robert Penner<sup>35</sup>. BSD 3-clause “New” or “Revised” License.
- Efficient Binary-Decimal and Decimal-Binary Conversion Routines for IEEE Doubles<sup>36</sup>. BSD 3-clause “New” or “Revised” License.
- forkfd. MIT License.
- FreeBSD strtoll and strtoull<sup>37</sup>. BSD 3-clause “New” or “Revised” License.
- Freetype 2<sup>38</sup>. Freetype Project License or GNU General Public License v2.0 only.
- Freetype 2 - Bitmap Distribution Format (BDF) support<sup>39</sup>. MIT License.
- Freetype 2 - Portable Compiled Format (PCF) support<sup>40</sup>. MIT License.
- Freetype 2 - zlib<sup>41</sup>. zlib License.
- geosimplify-js polyline simplification library<sup>42</sup>. geosimplify-js License.
- Google Fonts<sup>43</sup>. Apache 2 License.
- Gradle wrapper<sup>44</sup>. Apache License 2.0.
- Guidelines Support Library<sup>45</sup>. MIT License.
- HarfBuzz. MIT License.
- HarfBuzz-NG<sup>46</sup>. MIT License.

---

<sup>27</sup> <http://www.freetype.org>

<sup>28</sup> <https://www.gnome.org/fonts/>

<sup>29</sup> <https://github.com/raptor/clip2tri>

<sup>30</sup> <http://www.angusj.com/delphi/clipper.php>

<sup>31</sup> <http://zlib.net/>

<sup>32</sup> <https://dejavu-fonts.github.io/>

<sup>33</sup> <https://github.com/mapbox/earcut.hpp>

<sup>34</sup> <https://earth-info.nga.mil>

<sup>35</sup> <http://robertpenner.com/easing/>

<sup>36</sup> <https://github.com/google/double-conversion>

<sup>37</sup> <https://github.com/freebsd/freebsd/>

<sup>38</sup> <http://www.freetype.org>

<sup>39</sup> <http://www.freetype.org>

<sup>40</sup> <http://www.freetype.org>

<sup>41</sup> <http://www.freetype.org>

<sup>42</sup> <https://github.com/mapbox/geosimplify-js>

<sup>43</sup> <https://github.com/google/fonts>

<sup>44</sup> <https://gradle.org>

<sup>45</sup> <https://github.com/microsoft/GSL>

<sup>46</sup> <http://harfbuzz.org>

- [IAccessible2 IDL Specification](#)<sup>47</sup>. BSD 3-clause “New” or “Revised” License.
- [JavaScriptCore Macro Assembler](#)<sup>48</sup>. BSD 2-clause “Simplified” License.
- [KDAB’s helper class for single-instance policy applications](#)<sup>49</sup>. MIT License.
- [libdbus-1 headers](#)<sup>50</sup>. Academic Free License v2.1, or GNU General Public License v2.0 or later.
- [LibJPEG-turbo](#)<sup>51</sup>. Independent JPEG Group License.
- [LibPNG](#)<sup>52</sup>. libpng License and PNG Reference Library version 2.
- [Linux Performance Events](#)<sup>53</sup>. GNU General Public License v2.0 only with Linux Syscall Note.
- [Material Design Icons](#)<sup>54</sup>. Apache License.
- MD4. Public Domain.
- [MD4C](#)<sup>55</sup>. MIT License.
- MD5. Public Domain.
- [Metaf library](#)<sup>56</sup>. MIT License.
- Native Style for Android. Apache License 2.0.
- [OpenGL ES 2 Headers](#)<sup>57</sup>. MIT License.
- [OpenGL Headers](#)<sup>58</sup>. MIT License.
- [openssl library](#)<sup>59</sup>. Apache 2 License.
- [OSM Liberty](#)<sup>60</sup>. BSD License.
- [PCRE2](#)<sup>61</sup>. BSD 3-clause “New” or “Revised” License.
- [PCRE2 - Stack-less Just-In-Time Compiler](#)<sup>62</sup>. BSD 2-clause “Simplified” License.
- [Pixman](#)<sup>63</sup>. MIT License.
- [Poly2Tri Polygon Triangulation Library](#)<sup>64</sup>. BSD 3-clause “New” or “Revised” License.
- QEventDispatcher on macOS. BSD 3-clause “New” or “Revised” License.
- [QHttpEngine](#)<sup>65</sup>. MIT License.
- [Qt Toolkit, Libraries and Modules](#)<sup>66</sup>. GNU General Public License v3.0.

<sup>47</sup> <https://wiki.linuxfoundation.org/accessibility/iaccessible2/>

<sup>48</sup> <https://trac.webkit.org/wiki/JavaScriptCore>

<sup>49</sup> <https://github.com/KDAB/KDSingleApplication>

<sup>50</sup> <https://www.freedesktop.org/wiki/Software/dbus/>

<sup>51</sup> <http://libjpeg-turbo.virtualgl.org/>

<sup>52</sup> <http://www.libpng.org/pub/png/libpng.html>

<sup>53</sup> <https://www.kernel.org>

<sup>54</sup> <https://github.com/google/material-design-icons>

<sup>55</sup> <https://github.com/mity/md4c>

<sup>56</sup> <https://github.com/nnaumenko/metaf>

<sup>57</sup> <https://www.khronos.org/>

<sup>58</sup> <https://www.khronos.org/>

<sup>59</sup> <https://www.openssl.org>

<sup>60</sup> <https://github.com/maputnik/osm-liberty>

<sup>61</sup> <http://www.pcre.org/>

<sup>62</sup> <http://www.pcre.org/>

<sup>63</sup> <http://www.pixman.org/>

<sup>64</sup> <http://code.google.com/p/poly2tri/>

<sup>65</sup> <https://github.com/nitroshare/qhttpengine>

<sup>66</sup> <https://qt.io>

- [Secure Hash Algorithm SHA-1](#)<sup>67</sup>. Public Domain.
- Secure Hash Algorithm SHA-3 - brg\_endian. BSD 2-clause “Simplified” License.
- Secure Hash Algorithm SHA-3 - Keccak. Creative Commons Zero v1.0 Universal.
- Secure Hash Algorithms SHA-384 and SHA-512. BSD 3-clause “New” or “Revised” License.
- [Shadow values from Angular Material](#)<sup>68</sup>. MIT License.
- Smooth Scaling Algorithm. BSD 2-clause “Simplified” License and Imlib2 License.
- [SQLite](#)<sup>69</sup>. Public Domain.
- [sRGB color profile icc file](#)<sup>70</sup>. International Color Consortium License.
- [Sunset library](#)<sup>71</sup>. GNU General Public License v2.0.
- [Tango Icons](#)<sup>72</sup>. Public Domain.
- [Tango Weather Icon Pack by Darkobra](#)<sup>73</sup>. Public Domain.
- Text Codec: EUC-JP. BSD 2-clause “Simplified” License.
- Text Codec: EUC-KR. BSD 2-clause “Simplified” License.
- Text Codec: GBK. BSD 2-clause “Simplified” License.
- Text Codec: ISO 2022-JP (JIS). BSD 2-clause “Simplified” License.
- Text Codec: Shift-JIS. BSD 2-clause “Simplified” License.
- Text Codec: TSCII. BSD 2-clause “Simplified” License.
- Text Codecs: Big5, Big5-HKSCS. BSD 2-clause “Simplified” License.
- [The Public Suffix List](#)<sup>74</sup>. Mozilla Public License 2.0.
- [TinyCBOR](#)<sup>75</sup>. MIT License.
- [Unicode Character Database \(UCD\)](#)<sup>76</sup>. Unicode License Agreement - Data Files and Software (2016).
- [Unicode Common Locale Data Repository \(CLDR\)](#)<sup>77</sup>. Unicode License Agreement - Data Files and Software (2016).
- [Valgrind](#)<sup>78</sup>. BSD 4-clause “Original” or “Old” License.
- [Vulkan API Registry](#)<sup>79</sup>. MIT License.
- [Vulkan Memory Allocator](#)<sup>80</sup>. MIT License.
- [WebGradients](#)<sup>81</sup>. MIT License.
- Wintab API. LCS-Telegraphics License.

---

<sup>67</sup> <http://www.dominik-reichl.de/projects/csha1/>

<sup>68</sup> <https://angularjs.org/>

<sup>69</sup> <https://www.sqlite.org/>

<sup>70</sup> <http://www.color.org/>

<sup>71</sup> <https://github.com/buelowp/sunset>

<sup>72</sup> [http://tango.freedesktop.org/Tango\\_Desktop\\_Project](http://tango.freedesktop.org/Tango_Desktop_Project)

<sup>73</sup> <https://www.deviantart.com/darkobra/art/Tango-Weather-Icon-Pack-98024429>

<sup>74</sup> <http://publicsuffix.org/>

<sup>75</sup> <https://github.com/intel/tinycbor>

<sup>76</sup> <https://www.unicode.org/ucd/>

<sup>77</sup> <http://cldr.unicode.org/>

<sup>78</sup> <http://valgrind.org/>

<sup>79</sup> <https://www.khronos.org/>

<sup>80</sup> <https://github.com/GPUOpen-LibrariesAndSDKs/VulkanMemoryAllocator>

<sup>81</sup> <https://webgradients.com/>



- [X Server helper](#)<sup>82</sup>. X11 License and Historical Permission Notice and Disclaimer.
- [XCB-XInput](#)<sup>83</sup>. MIT License.
- XSVG. Historical Permission Notice and Disclaimer - sell variant.

---

<sup>82</sup> <https://www.x.org/>

<sup>83</sup> <https://xcb.freedesktop.org/>



## 13.1 Platform notes

### 13.1.1 Android

#### Wi-Fi locking

When running on Android, the app acquires a Wi-Fi lock as soon as the app receives heartbeat messages from one of the channels where it listens for traffic receivers. The lock is released when the messages no longer arrive.

## 13.2 Traffic Receiver

### 13.2.1 Communication

**Enroute Flight Navigation** expects that the traffic receiver deploys a WLAN network via Wi-Fi and publishes traffic data via that network. In order to support a wide range of devices, including flight simulators, the app listens to several network addresses simultaneously and understands a variety of protocols.

**Enroute Flight Navigation** watches the following data channels, in order of preference.

- A TCP connection to port 2000 at the IP addresses 192.168.1.1, where the app expects a stream of FLARM/NMEA sentences.
- A TCP connection to port 2000 at the IP addresses 192.168.10.1, where the app expects a stream of FLARM/NMEA sentences.
- A UDP connection to port 4000, where the app expects datagrams in GDL90 or XGPS format.
- A UDP connection to port 49002, where the app expects datagrams in GDL90 or XGPS format.

**Enroute Flight Navigation** expects traffic data in the following formats.

- FLARM/NMEA sentences must conform to the specification outlined in the document FTD-012 [Data Port Interface Control Document \(ICD\)](#)<sup>84</sup>, Version 7.13, as published by [FLARM Technology Ltd.](#)<sup>85</sup>.

<sup>84</sup> <https://flarm.com/support/manuals-documents/>

<sup>85</sup> <https://flarm.com/>

- Datagrams in GDL90 format must conform to the [GDL 90 Data Interface Specification](#)<sup>86</sup>.
- Datagrams in XGPS format must conform to the format specified on the [ForeFlight Web site](#)<sup>87</sup>.

### 13.2.2 Known issues

The GDL90 protocol has a number of shortcomings, and we recommend to use FLARM/NMEA whenever possible. We are aware of the following issues.

#### Altitude measurements

According to the GDL90 Specification, the ownship geometric height is reported as height above WGS-84 ellipsoid. There are however many devices on the market that wrongly report height above main sea level. Different apps have different strategies to deal with these shortcomings.

- **Enroute Flight Navigation** as well as the app Skydemon expect that traffic receivers comply with the GDL90 Specification.
- ForeFlight has extended the GDL90 Specification so that traffic receivers can indicate if they comply with the specification or not.
- Many other apps expect wrong GDL90 implementations and interpret the geometric height as height above main sea level.

#### MODE-S traffic

Most traffic receivers see traffic equipped with MODE-S transponders and can give an estimate for the distance to the traffic. They are, however, unable to obtain the precise traffic position. Unlike FLARM/NMEA, the GDL90 Specification does not support traffic factors whose position is unknown. Different devices implement different workarounds.

- Stratux devices generate a ring of eight virtual targets around the own position. These targets are named “Mode S”.
- Air Avionics devices do the same, but only with one target.
- Other devices create a virtual target, either at the ownship position or at the north pole and abuse the field “Navigation Accuracy Category for Position” to give the approximate position to the target.

**Enroute Flight Navigation** has special provisions for handling targets called “Mode S”, but users should expect that this workaround is not perfect.

### 13.2.3 ForeFlight Broadcast

Following the standards established by the app ForeFlight, **Enroute Flight Navigation** broadcasts a UDP message on port 63093 every 5 seconds while the app is running in the foreground. This message allows devices to discover Enroute’s IP address, which can be used as the target of UDP unicast messages. This broadcast will be a JSON message, with at least these fields:

```
{
  "App": "Enroute Flight Navigation",
  "GDL90": {
    "port": 4000
  }
}
```

<sup>86</sup> [https://www.faa.gov/nextgen/programs/adsb/archival/media/gdl90\\_public\\_icd\\_reva.pdf](https://www.faa.gov/nextgen/programs/adsb/archival/media/gdl90_public_icd_reva.pdf)

<sup>87</sup> <https://www.foreflight.com/support/network-gps/>

The GDL90 “port” field is currently 4000, but might change in the future.