Enroute Flight Navigation

Release 2.2.4

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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[1], 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[2].

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.

[1] https://akaflieg-freiburg.de/
[2] https://www.aviationweather.gov/

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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:SERA.2010[3]

> 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.

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[3] 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 excempt 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[4] 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.

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[4] https://dontkillmyapp.com

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Getting started

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2.1 App installation

Installation on Android devices Enroute Flight Navigation is available as an Android App in the Google Play Store[5].

An unofficial version of the app is also available at F-Droid[6]. 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[7] and snapcraft.io[8]. 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 navaids. 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 *Settings*.

- On the settings page, choose the item *Maps* in the *Libraries* section.

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[5] https://play.google.com/store/apps/details?id=de.akaflieg_freiburg.enroute
[6] https://f-droid.org/de/packages/de.akaflieg_freiburg.enroute/
[7] https://flathub.org/apps/details/de.akaflieg_freiburg.enroute
[8] https://snapcraft.io/enroute-flight-navigation

- On the map page, click or tap on the desired maps. The maps will then be downloaded and installed on your device.

Caution: Do not forget that you need aeronautical maps **and** base maps for the desired area of flight.

Note: The base maps are large. Make sure that you have a good internet connection before you download maps. It might be inadvisable to download maps via the mobile phone network.

Note: 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 costs 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.

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. Look around any play with the app!

2.3 The moving map

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.

Ground Mode

The figure *Moving map display in ground mode* shows how the display will look while you are on the ground.

1. Own Position. The own position indicator will be gray if the satellite navigation system has not yet acquired a valid position. It will be displayed in blue color if GPS position is available. The own position will be indicated as round shape when no motion is sensed and displayed as an arrow when moving.

2. North Indicator. This button can also be used to switch between the display modes *track up* and *north up*.

3. Zoom buttons.

4. Map Scale.

5. Menu button.

You can use the standard gestures to zoom, pan and rotate the map to your liking. Double tap or tap-and-hold anywhere in the map to obtain information about the airspace situation at that point. If you double tap on an airfield, navaid or reporting point, detailed information about the facility will be shown.

Flight Mode

As soon as you are flying, the moving maps switches to *flight mode*. The figure *Moving map display in flight mode* shows how the display will look while you are in the air.

Note: Flight detection might fail in slow-flying aircraft, such as balloons or paragliders. The settings allow to force the flight mode to "on".
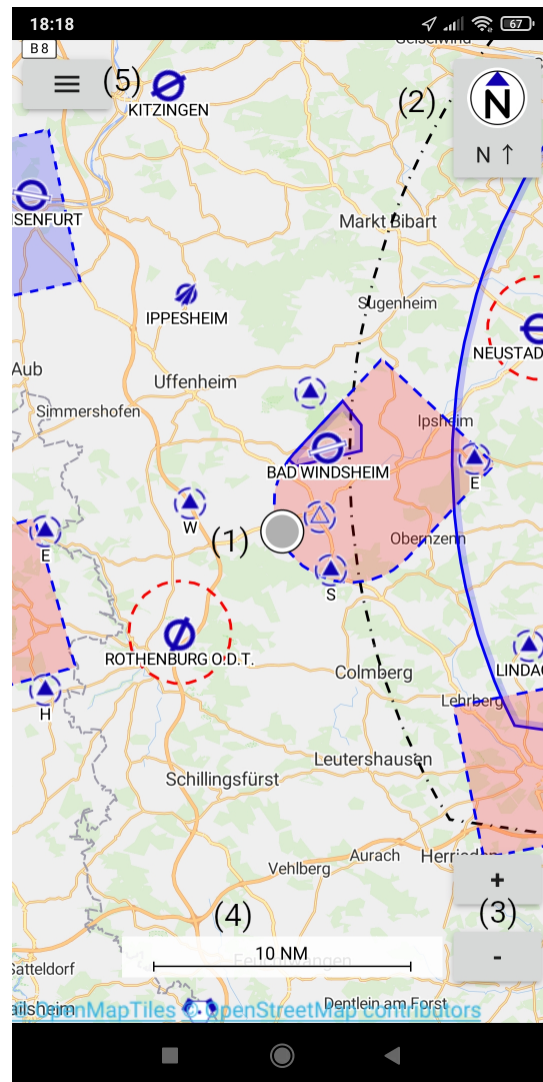

Fig. 1: Moving map display in ground mode

Fig. 2: Moving map display in flight mode

1. Own Position. The blue arrow shape indicates that the satellite navigation system knows your position and your direction of movement.

2. Flight Path Vector, showing the projected track for the next five Minutes.

3. North Indicator. This button can also be used to switch between the display modes *track up* and *north up*.

4. Autopan button. Click this button to switch to *autopan mode* where the map is automatically centered about your current position. Pan the map manually to stop the *autopan mode*.

5. Zoom buttons.

6. Menu button.

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

- Altitude
- Ground Speed
- True Track
- Universal Coordinated Time (UTC)

> **Warning:** The display shows the altitude reported by the satellite navigation system, with geoid corrections applied. Depending on temperature and air density, the value will generally differ from the value shown by your barometric altimeter, even if the altimeter is set to QNH. **The altitude reading must not be used for navigation in airspace classes C and D.**

2.4 Your first flight

Now you are ready for the first use of **Enroute Flight Navigation**. General operation is very intuitive. The primary purpose of **Enroute Flight Navigation** of displaying a moving aeronautical map is directly available after starting the app. Before using the moving map function you have to make sure the GPS of your mobile device is operating properly. The own position indicator will be gray if GPS position is not available and will be displayed in blue color if GPS position is available. The own position will be indicated as round shape when no motion is sensed and displayed as an arrow with flight path marker when moving.

> **Warning:** Make sure the GPS position is correct and valid to avoid loss of situational awareness. Loss of situational awareness is a common cause of severe accidents in aviation.

To show a planned route on the moving map display you may:

1. **Use 'Direct'**

    - Double Touch the desired Waypoint
    - Select 'Direct'

2. **Plan a route**

    - Double Touch the desired Waypoint
    - Select (+) 'to Route'

The planned route will be displayed as a light green line on the map display. More detailed information on route planning will be given in the dedicated section.

Airspace awareness

Information related to any selected point on the Map will be displayed when double touching a point.

The displayed Information for arbitrary points will include:

- Distance to point

- True bearing to point

- Airspace classification including related frequencies and transponder code

The displayed Information for reporting points or Navaids will include:

- Distance to point

- True bearing to point

- Designation, controlling agency and radio frequencies

- Airspace classification including related radio frequencies and transponder code

The displayed Information for airfields will include:

- Distance to point

- True bearing to point

- Meteorological information summary if available

- Designation, controlling agency and radio frequencies and Navaids

- Airfield data for Runways and field elevation

- Airspace classification including related radio frequencies and transponder code

More information on the features and operation will be given in the 'Further Steps' part of the **Enroute Flight Navigation** manual.

The following topics are described in more detail **Enroute Flight Navigation** 'Reference' section of the manual:

- Display of Airspace

- Display of Aeronautical Data

- Weather Data

- Settings

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Further Steps

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When using **Enroute Flight Navigation** on a frequent basis you may want to get into some more detail on the features and configure the app.

3.1 Menu

Functions not directly accessible on the moving map display and more options are accessed via the menu symbol in the upper left edge of the moving map display.

When touching the Menu area in the left upper corner of the screen the menu will open and give the following options:

- Route — see Flight Routes described below

- Nearby Waypoints — will show the closest 20 aerodromes, navaids or reporting points

- Weather — will open the weather display

- Set Altimeter — allows to enter current altitude to have altitude displayed using an offset

- Settings — see below

- **Information**

  - Satellite Status — will open a sub-window showing the status of GPS reception

  - Manual — will show this manual

  - About **Enroute Flight Navigation**

  - Participate

  - Donate

- Bug Report — will open a link to provide feedback

- Exit — will shut down the application

Only some reference to Menu items is given in this section. More details may be found in the 'Reference' section of the manual.

3.2 Settings

The settings Menu will allow to customize **Enroute Flight Navigation** and give access to program status. The settings Menu gives the following options:

- **Hide Airspace above FL 100** — allows to select display of airspace above FL100 displayed.
- **Automatic flight detection** — allows to select the display of flight mode on the ground
- **Flight Routes** — will show a window with the previously stored routes
- **Maps** — will show a window with the available and previously installed Aviation and Base Maps
- **Use metric units** — allows to select display in metric units
- **Use English** — allows to select English Language for display

Note: The items to be selected by the on-off slider will enable the related function. The current status of the selected item is shown below the item.

Note: If you do not select "Hide Airspace above FL 100" the FIS frequencies for the Airspace C above FL100 will be displayed. In general this frequencies are also applicable below FL 100.

Note: When Automatic flight detection is not selected the display will always be in flight mode.

Note: If "Use English" is not selected the standard language selected for your device will be used if available.

3.3 Waypoints

Waypoints are the central element of aeronautical navigation. A waypoint is selected by touching the moving map at the location of the waypoint display. Waypoints may also be directly added to a route by list selection or search.

The following types of Waypoints are available:

- Aerodromes
- Reporting points
- Navaids
- Arbitrary points on the map.

For Aerodromes the full set of information will be displayed:

- Aerodrome symbol indicating type of airport
- Aerodrome designation
- Distance and Bearing to Aerodrome
- Meteorological information if available
- Aerodrome communication information
- Airspace data

For Reporting Points the following information will be displayed:

- Reporting Point designation

- Distance and bearing to Reporting Point

- Reporting Point communication information

- Airspace data

For Navaids the following information will be displayed:

- Navaid symbol, designation and type

- Distance and bearing to Navaid

- Navaid ID, frequency and elevation

- Airspace data

For Arbitrary Points the following information will be displayed:

- Point designation if manually entered

- Distance and bearing to Point

- Airspace data

Legend:

1. Waypoint designation, bearing and distance

2. Waypoint meteorological information (only shown for airports if available)

3. Communication information related to waypoint (only shown if applicable)

4. Airspace information for waypoint

5. Area to select direct Navigation to waypoint

6. Area to add waypoint to current route

3.4 Flight Routes

Enroute Flight Navigation provides direct planning of one flight Route. A Route will remain present until it is cleared. Route planning is entered via the Menu point Route. The Menu is entered via the Menu Symbol in the upper left corner of the map area. Then the Route Symbol has to be touched to go to the Route area.

A Route may be planned in the following ways:

- "Direct" in the waypoint window will provide a Route between current position and desired waypoint
- "+" symbol in the waypoint window will add the waypoint to the last position of the Route.
- "Add Waypoint" in the Route window will open a selection window for a waypoint and add the selected waypoint to the route.

The Route Display will show the following information:

- Symbol of the waypoint
- Designation of the waypoint
- Route Point Menu
- **Navigation Data**
    - Distance between way points
    - Time calculated between way points using the cruise speed set in the "Aircraft and Wind" page
    - True Course between way points
    - True Heading between way points

Note: A Route may also be imported from a GPX file from another PC. After sending the GPX file as Email attachment **Enroute Flight Navigation** will offer to open the GPX file.

The Route Point Menu provides the option to:

- Move a waypoint up in the Route
- Move a waypoint down in the Route
- Remove a waypoint from the Route

The Route Menu is entered by touching the Route Menu Symbol on the Route page. For Arbitrary Points the standard designation "Waypoint" may be changed by touching the pencil symbol and entering a designation.

The following options are available from the Route Menu:

- Open a previously stored route from the library
- Save the current route to the library
- View the route library
- Share the Route in JSON or GPX format

- Open the Route in another APP using the JSON or GPX format

- Clear Route

- Reverse Route

The previously created and stored routes will be kept in a data base within **Enroute Flight Navigation**. Routes consist of the data for the selected way points. The Route data may be exported for use in other applications.

The Route display has 3 Sub windows:

- Route

- Wind

- ACFT

Legend:

1. Route sub-window

2. Selection area for wind sub-window

3. Selection area for aircraft sub-window

4. Route point sub-menu

5. Edit route point designation for arbitrary waypoints

6. Total distance, flight time and fuel consumption for flight route

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Route – Aircraft and Wind

The Aircraft and Wind sub-pages of the Route page allows to enter aircraft performance and wind data required for navigational calculations. The Aircraft Data will be used to determine the distance of the flight and the true course. The Wind data will will be used to calculate the true heading and duration of the flight. The duration of the flight will determine the fuel used. **Enroute Flight Navigation** only offers a very superficial flight planning and cannot replace a full flight planning, but is only intended to provide quick reference.

> **Warning:** Always perform a full flight preparation in accordance with the flight manual of the aircraft used. The use of **Enroute Flight Navigation** as primary flight planning may cause accidents leading to loss of lives.

The Wind sub-page of the Route page offers the following input fields:

- Direction in degrees
- Speed in knots

Only one speed, fuel consumption and wind may be entered for the whole route.

The Aircraft sub-page of the Route page offers the following input fields:

- **Aircraft**
    - Cruise Speed: Average Speed for Route
    - Descent Speed: Allows to enter a different speed for the descent phase (Currently not used)
    - Fuel Consumption: Average Fuel consumption per hour

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Connecting 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[9] by Air Avionics[10] with software version 5.

Users reported success with the following traffic receivers.

- Stratux devices[11]
- TTGO T-Beam devices[12]

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 WLAN network deployed by your traffic receiver. If the network is encrypted, you also need to know the WLAN password.

- If you use a Stratux or T-Beam device, set the device IP address to 192.168.1.1. Most FLARM devices use this address default and no configuration is required.

- 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.

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[9] http://www.air-avionics.com/?page_id=253
[10] http://www.air-avionics.com/
[11] http://stratux.me/
[12] https://www.amazon.de/TTGO-T-Beam-915Mhz-Wireless-Bluetooth/dp/B07SFVQ3Z8

4.2 Connecting 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 WLAN network, enter the network and connect to the traffic data stream whenever you go flying.

Step 1: Enter the traffic receiver's WLAN 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 WLAN comes online and is visible to your device.

- Enter the WLAN network deployed by your traffic receiver. This is usually done in the "WLAN Settings" of your device. Enter the WLAN password if required. Some devices will issue a warning that the WLAN is not connected to the internet. In this case, you might need to confirm that you wish to enter the WLAN network.

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

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 WLAN 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 WLAN 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.

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 Naviagtion map is shown below:

Map Feature	Data Origin
Airfields	openAIP
Airspace: Nature Preserve Areas	open flightmaps
Airspace: all other	openAIP
Navaids	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 Naviagtion 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 crate the base maps.

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Other

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
- Navaids
- 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 navaids. 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 navaids.

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.


6.1 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.

7 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
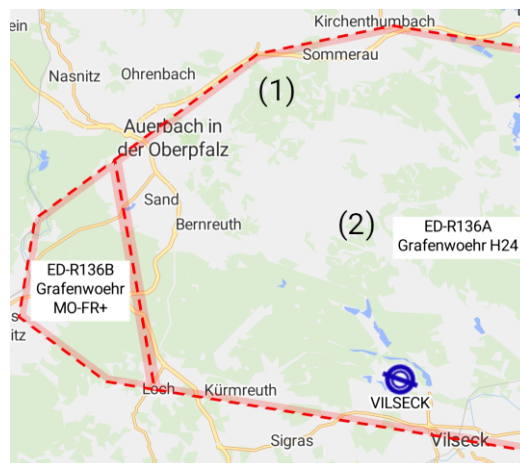
Legend:

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

7.1 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.

7.2 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

7.3 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 ares is given with the waypoint pop-up window:

- Area Name

- Area altitude limits

- Monitoring Frequency

- Mode 3 Squawk

7.4 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

7.5 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

7.6 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

7.7 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

7.8 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.

8

Weather

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 Waether page will allow to:

- Update the METAR and TAF data
- Disallow he 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:

⊖ **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 (4)
1010/1012 6000 BKN006

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 bering 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

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> **Caution:** 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.

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	Yel-low	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

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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

Software licenses

9.1 License of Enroute Flight Navigation

The program **Enroute Flight Navigation** is licensed under the GNU General Public License V3[13] or, at your choice, any later version of this license.

9.2 Third-Party software included in this program

- This program includes several libraries from the Qt project[14], licensed under the GNU Lesser General Public License (LGPL) version 3[15].
- This program includes the library qhttpengine[16], which is licensed under the MIT license[17].
- This program includes the library OpenSSL[18], licensed under the Apache License 2.0[19].

9.3 Data included in this program

- This program includes versions of the Google Roboto Fonts[20], which are licensed under the Apache License 2.0[21].
- This program includes several Google Material Design Icons[22], which are licensed under the Apache License 2.0[23].

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[13] https://www.gnu.org/licenses/gpl-3.0-standalone.html
[14] https://qt.io
[15] https://www.qt.io/download-open-source
[16] https://github.com/nitroshare/qhttpengine
[17] https://github.com/nitroshare/qhttpengine/blob/master/LICENSE.txt
[18] https://openssl.org
[19] https://www.openssl.org/source/license.html
[20] https://github.com/google/roboto
[21] https://github.com/google/roboto/blob/master/LICENSE
[22] https://github.com/google/material-design-icons
[23] https://github.com/google/material-design-icons/blob/master/LICENSE

- The style specification of the basemap is a modified version of the OSM liberty map design[24], which is in turn originally derived from OSM Bright from Mapbox Open Styles. The code is licensed under the BSD license[25]. The OSM style Bright from Mapbox Open Styles is licensed under the Creative Commons Attribution 3.0 license[26].

9.4 Base maps

- The base maps are modified data from OpenMapTiles[27], published under a CC-BY 4.0 design license[28].

9.5 Aviation maps

- The aviation maps contain data from openAIP[29], licensed under a CC BY-NC-SA license[30].
- The aviation maps contain data from open flightmaps[31], licensed under the OFMA General Users´ License[32].

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[24] https://github.com/maputnik/osm-liberty
[25] https://github.com/maputnik/osm-liberty/blob/gh-pages/LICENSE.md
[26] https://github.com/maputnik/osm-liberty/blob/gh-pages/LICENSE.md
[27] https://github.com/openmaptiles/openmaptiles
[28] https://github.com/openmaptiles/openmaptiles/blob/master/LICENSE.md
[29] http://www.openaip.net
[30] https://creativecommons.org/licenses/by-nc-sa/3.0/
[31] https://www.openflightmaps.org/
[32] https://www.openflightmaps.org/live/downloads/20150306-LCN.pdf

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<div style="background-color:#d3d3d3;">

Technical Notes

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10.1 Traffic Receiver

Enroute Flight Navigation expects that the traffic receiver deploys a WLAN network via Wi-Fi and publishes a stream of NMEA sentences at the IP address 192.168.1.1, port 2000 of that network. The NMEA sentences must conform to the specification outlined in the document FTD-012 Data Port Interface Control Document (ICD)[33], Version 7.13, as published by FLARM Technology Ltd[34].

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[33] https://flarm.com/support/manuals-documents/
[34] https://flarm.com/

Collection

There are two basic ways to plan a flight route:

- Menu - Route:
    - Enter Waypoints
    - Edit existing Route
    - Enter Wind data
    - Enter Aircraft data
- **Double touch Maps and open Waypoints**
    - Direct will make a route from present position to Waypoint
    - '+' to Route will add the Waypoint to the current Route

A Route will remain in **Enroute Flight Navigation** until overwritten or removed. Routes may be saved or shared.

The **Enroute Flight Navigation** map display is automatically centered to display the own position to have about 80 % of the display area in direction of flight. The map display may be shifted by touching the display and moving it to the desired position. After shifting the "Center on Position" Symbol will be displayed. After touching he "Center on Position" Symbol the map will be centered to give maximum map area in direction of flight again.

Track Up and North Up Mode

The **Enroute Flight Navigation** map display may be switched between a Track Up display and a North Up display by touching the gray window in the upper right area. Touching the display orientation area toggles between North up and Track Up.

Legend:

1. Own Position
2. Flight Path Vector (5 Minutes)
3. North Indicator, also area to switch between track up and north up
4. Zoom area
5. Scale
6. Menu area

The North Up mode provides a map display always showing the map north up. The **Enroute Flight Navigation** map display in North Up mode will center the display to provide about 80% area in direction of flight. In case the map display has been manually rotated the area besides the direction arrow will show the map orientation in degrees.