SafePilot 24.3 User Guide

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1 Introduction to SafePilot

To bring large vessels into port, you need to choose the solution that will enable the ship's captain, skippers and port operators to precisely coordinate their efforts – and work as a cohesive unit.

SafePilot from Trelleborg offers the latest in navigation and piloting and port systems. SafePilot uses state of the art software and smart technology to help pilots and ports optimize safety and efficiency in their day to day operations. Developed in conjunction with working marine pilots from across the world, SafePilot offers the most up to date user friendly portable pilot unit software available. Built around the iPadOS operating system, SafePilot supports the use of handheld tablets for improved portability and instant accessibility. A touch screen interface allows quick interaction with the PPU to make piloting smoother and easier, while the instant zoom function and new intelligent chart structure give you faster zooming than any other navigational software.

1.1 Benefits of greater piloting control

Improved accuracy

With SafePilot, only information relevant to the current operational phase is provided. Filtering data in this way eliminates the risk of information overload, allowing faster, more accurate and more confident decision making.

Enhanced safety

SafePilot gives an enhanced situational overview of current and other vessels, including true shape graphics, speed and direction to improve safety. The pre-operation demonstration capability and lock feature against accidental modification also support a safe port approach.

Real time information

By providing accurate real time data, such as rate of turn, that is independent of a ship's AIS, SafePilot improves communication between the bridge team, pilot and port to reduce the margin for error.

1.2 Why choose SafePilot?

SafePilot is a high quality piloting software tool that improves response and decision making times to give the pilot greater control an create more accurate piloting and navigational maneuvers.

- Dedicated 3D chart kernel with fast action touch screen zooming and panning functionality.
- Minimum setup time with editable vessel database, and automatic transfer of existing vessel maneuvers.
- Only data relevant to the current operational phase is displayed to improve focus and decision making.
- Data is presented clearly with color coded signal quality indication and additional information of satellite details, raw data, differential corrections, etc.
- Separate planning mode for easy overview and preparation, includes a lock feature to eliminate unintended changes during maneuvers
- Close route monitoring with distance, bearing and ETA to individual waypoints and cross track monitoring to the route
- Data such as heading, COG, SOG, ROT and position quality is always displayed.

- True shape graphical illustration of own and other vessels. Source extra data from other vessels via AIS and an adjustable vector indicates current speed and direction.
- Prediction footprints include ROT to give a clear picture of the vessel's movements ahead in time. Past track with adjustable time interval is also included.
- Automatic display of fore and aft motion vector at turns or low speed.
- Ability to replay previous maneuvers and alter scaling, routes and fender lines for training and optimization purposes.
- Unique scrubbing features provide visual support for the Master-Pilot exchange (MPX) phase allowing pilot demonstration of route and maneuvers to captain and crew.

2 Getting started

2.1 Access to Local Network

The TrelleborgPPUs create a local WiFi hotspot to which the iPad is connected (see section 3.2 on page 9). In iPadOS14 and later, SafePilot needs permissions to connect to devices on the local network to be able to communicate with the PPU. When SafePilot starts the first time it will ask for permissions. Press OK.

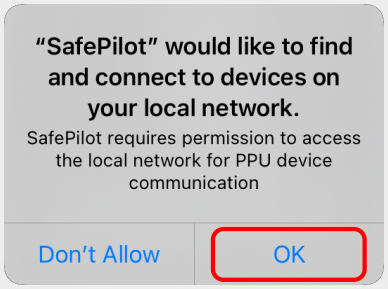

Figure 2.1: Allow local network access for SafePilot.

If you pressed 'Don't Allow' by mistake, the permission can be changed in iPadOS Settings in the SafePilot section in the field 'Local Network'.

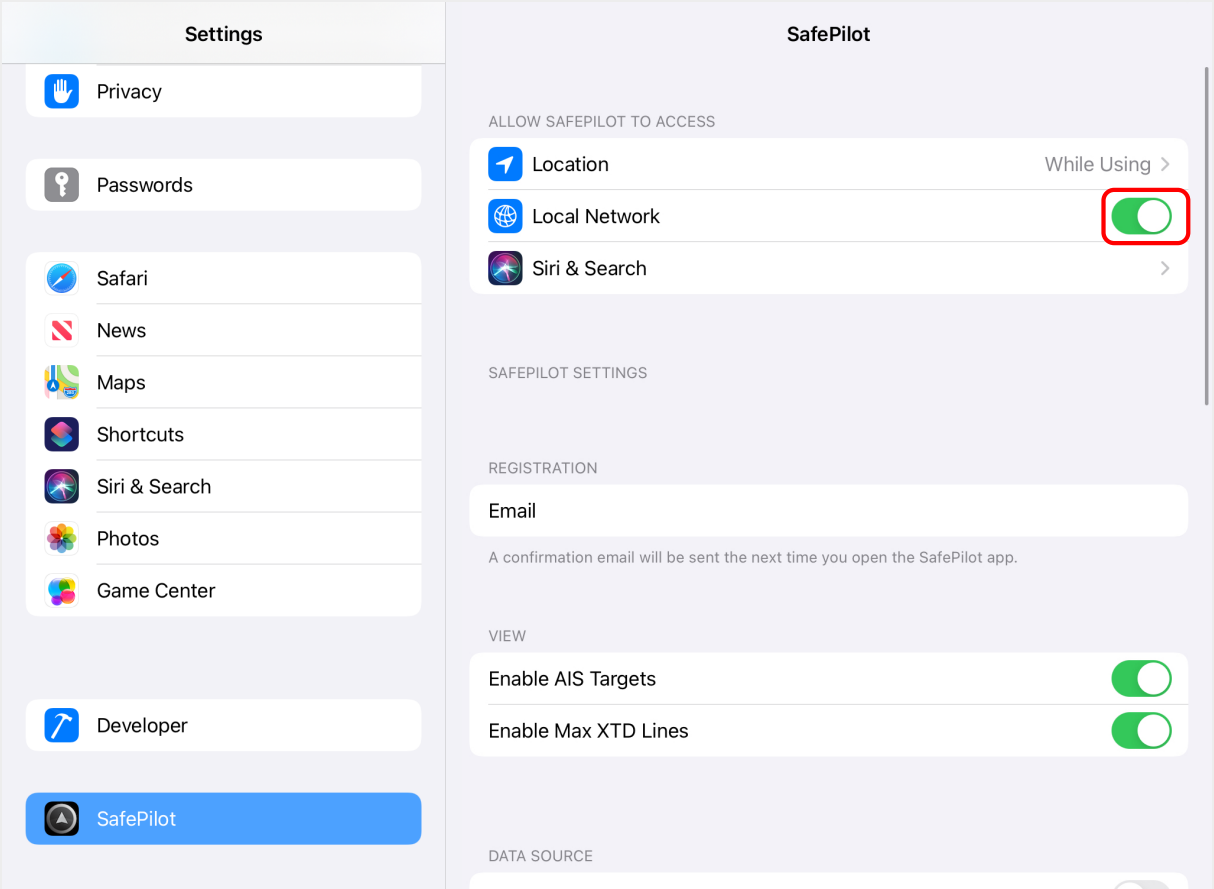

Figure 2.2: Allow local network access for SafePilot from settings.

2.2 Licensing

You need to register your SafePilot software with an e-mail address which will serve as your license ID.

This is done in the settings app (section 2.3 on the next page) and requires an internet connection to complete. Fill in the email address (fig. 2.3) attached to your license and start SafePilot. It will then check for an available license and download it. The content of the license may be validated within the *About* tab within the *Control Center* in section 11.5 on page 30.

Note 2.2-1

Every time you register a license on a new iPad, you will need to confirm the registration by clicking in the email sent to the email address by Trelleborg.

Note 2.2-2

If you are in charge of multiple devices, each device must be registered with a unique license to work properly.

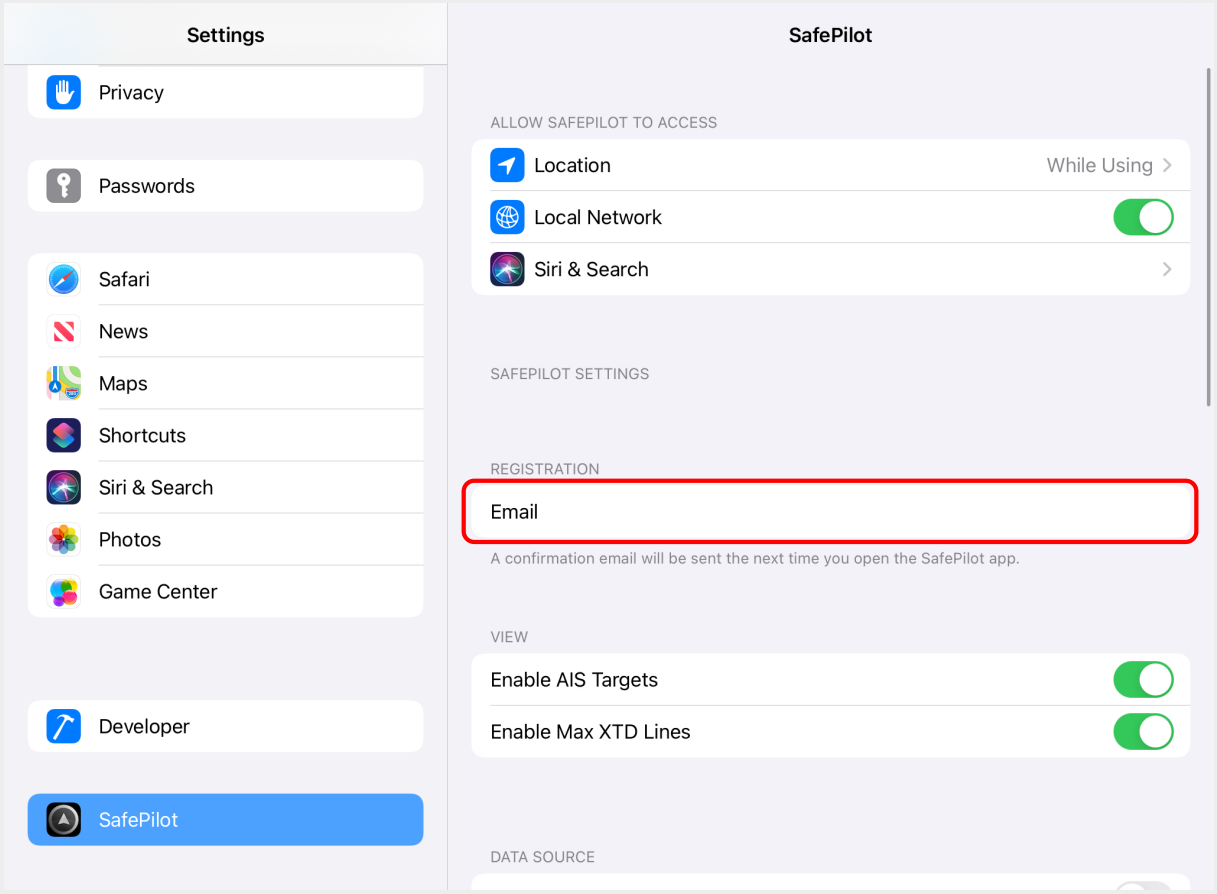

Figure 2.3: Add SafePilot license.

2.3 The settings app

You may configure personal settings for SafePilot within the *Settings app*. These settings are not meant to be changed very often and are therefore not included within SafePilot. The configurations you will find are among others:

- Licensing
- AIS targets
- Expected GPS source
- Units
- Ship details

To access the *Settings app* go to the *Home screen* → *Settings* → *SafePilot* and look at the options available. See fig. 2.4.

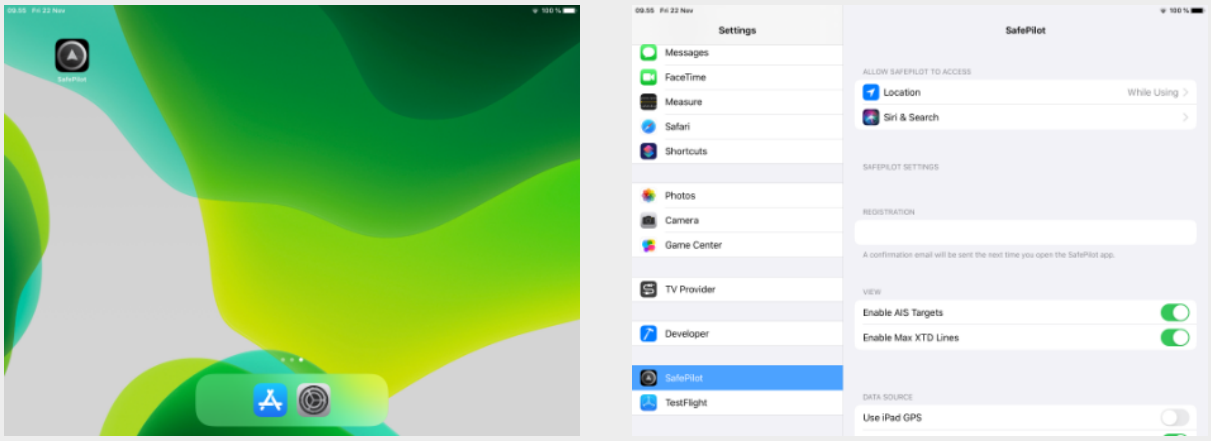

Figure 2.4: How to access SafePilot inside iPadOS' *Settings app*.

3 PPU device setup

3.1 Antenna setup

To obtain the full performance and accuracy of a CAT device the antenna locations must be chosen with care. The following points must be fulfilled for optimal operation. See an example in fig. 3.1. see further instructions in the manual of the device located at: `https://safepilot.eu/manuals/`.

1. The antennas must be a minimum of 1 meter away from any obstructions.
2. The antennas should have a clear view of the sky.
3. The antennas should be placed with a minimum of 4 meters between (baseline). A shorter baseline will result in a decrease of heading accuracy.

Figure 3.1: Note the surroundings when positioning the CAT device.

3.2 Connecting the iPad to a CAT device

All CAT devices communicate with the iPad using a local Wi-Fi network. After turning on the CAT device, the Wi-Fi network will appear in the list of available Wi-Fi networks on the iPad.

To connect to a CAT device, go to the iPad Wi-Fi settings and select the network created by the CAT device. The name of the network is the device's model name followed by a unique number.

Once connected to a CATs network, the iPad will remember the network and automatically connect to it in the future.

3.3 GPS and device status

You can always investigate the GPS and device status from SafePilot. The current status of the GPS is always visible in the left side of the *Top Panel*. By tapping on it, you will see details about the position source and the CAT unit - see fig. 3.2 on the next page.

Tapping on the satellites line in the list brings up more details about the current satellite constellation. This includes among other things the PRN number, elevation, azimuth, signal/noise ratio and what system they belong to (GPS, Galileo or GLONASS). To see the raw data received from the connected device tap on the list symbol (3 blue lines) at the top right corner. If a connected device is low on battery,

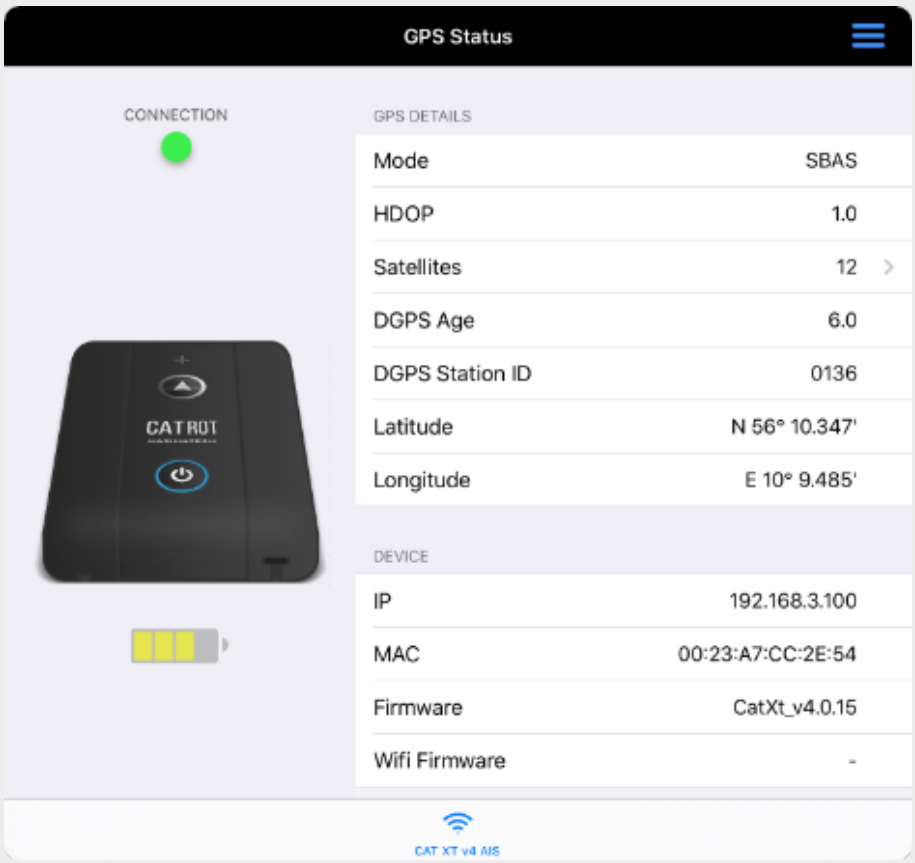

Figure 3.2: The detailed GPS and device status view within SafePilot.

a battery warning symbol is shown alongside the GPS status icon and by the battery indicator in the detailed window. If the battery level becomes critical, the battery warning symbol will flash.

The GPS mode can be used to locate the expected accuracy as shown in table 3.1.

Mode	CAT I, CAT XT	CAT MAX, CAT PRO
RTK		1-2 cm.
FRTK		20 cm.
DGPS	50 cm.	40 cm.
SBAS	70 cm.	60 cm.
GPS	150 cm.	120 cm.
AIS	Based on vessel instrumentation.	
EST	Estimated.	
iPad	Using the internal GPS of the iPad.	
INV	Invalid position data.	
N/A	No data received.	

Table 3.1: Shows the maximum +/- accuracy based on the GPS mode ordered from highest to lowest.

4 Understanding the panels

4.1 The *Top Panel*

The *Top Panel* is always displayed at the top of the screen. It contains the most important navigational information.

From the left: Position source and status, speed over ground (SOG), rate of turn (ROT), heading (HDG) and course over ground (COG).

The *Contexts Panel* is positioned on the left-hand side and is used to switch between operation modes, called: Contexts. It includes from the top:

- The *Passage Plan* (described in section 6 on page 13)
- The *Context Wheel* (described in section 8 on page 19)
- The *Control Center* (described in section 11 on page 27)

4.2 The *Contexts Panel*

In the case where more than one context is available, the *Context Wheel* is used to switch between these. Each context is specialized to display the most relevant information about the current operation.

The panel can be hidden by dragging it out of the screen, enabling more screen space.

4.3 The *Tools Panel*

Some contexts include additional panels positioned either on the right-hand side or at the bottom of the screen. These panels include additional information that is essential to the operation.

As with the *Contexts Panel*, the right-side panel can also be hidden by dragging it out of the screen.

5 Chart control

SafePilot supports instant zooming and fast response times on user input. To operate the chart view you simply do any of the following:

- Drag to pan.
- Pinch or double tap to zoom.

5.1 Chart orientation, scaling and navigation

A compass is located in the top right corner of the screen. A scale label is placed below the compass which indicates the distance from the center of the screen to the top of the screen.

By tapping on the compass you will get options to change the orientation of the chart and to quick jump between locations and vessels.

If you choose to use heading up, the compass will rotate towards north as your vessel rotates in the chart. If you hold your finger on the compass symbol, the chart orientation mode is toggled between north and heading up.

In the *Quick Jump Panel*, it is possible to define views and name them. Having named locations allows you to quickly reposition the chart on the desired location without having to pan and zoom on the chart. When adding a new view, the current zoom level and location is saved with a name. To quickly change to one of the named locations – simply tap on the name in the list. You can rearrange and delete items on the list by pressing edit. In the bottom of this window you can select the *Vessels* tab. This will bring you to the list of all vessels currently in the chart. These vessels are sorted with the closest at top or alphabetically. Select a vessel to see the list of its particulars and tap on the magnification symbol to jump to its location.

Whenever your vessel is shown on the screen, the screen will follow the vessel. If the chart is moved, so your vessel is no longer visible on the screen, the screen will be fixed on the current location and will no longer follow your vessel. In this case an arrow pointing to your vessel will be shown to indicate in which direction the vessel is heading. By tapping this arrow symbol, the chart will be repositioned at your vessel.

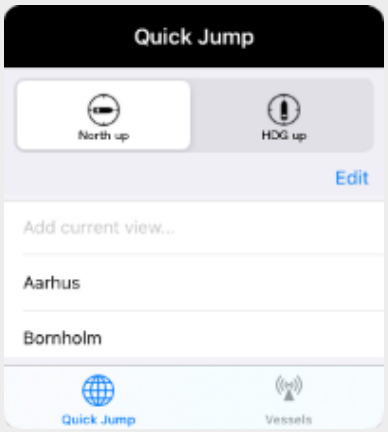

Figure 5.1: The *Quick Jump Panel*.

6 Passage plan

The *Passage Plan* allows you to configure your own vessel particulars as well as the planned route for the operation. It is accessed by tapping on the list icon at the top of the left-hand sidebar. Note that a warning symbol on the icon indicates that essential data are missing for optimal operation.

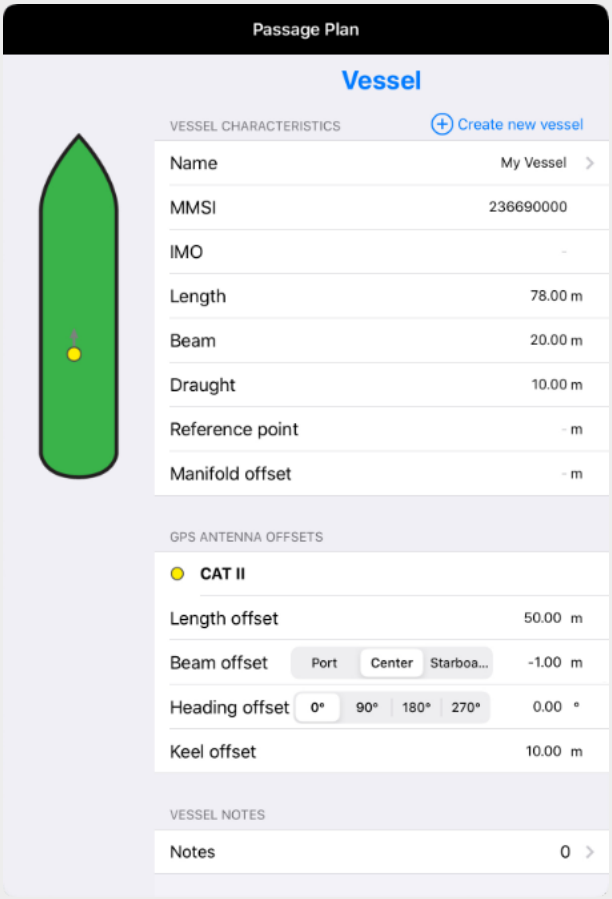

Figure 6.1: An example *Passage Plan* setup.

6.1 Vessel setup

Vessels received from AIS are automatically saved for easy setup. To select a vessel, tap the arrow next to the vessel name and select a vessel. Alternatively you may enter all data manually.

6.1.1 The reference point

The reference point is usually used as the conning position which are the base for many calculations in SafePilot. The position is defined by the distance from the bow to a point of your choice. See more about the conning position in section 7.1.3 on page 15.

6.2 GPS antenna setup

The GPS antenna offsets indicate the location of the GPS antenna(s) on your own vessel, e.g. CAT I, CAT XT, CAT MAX or the vessels own GPS antenna if you are using a CAT ROT. The vessel sketch on the left side of the *Passage Plan* shows the current antenna position based on the entered offsets.

6.2.1 Beam offset

The beam offset is used to add a sideway offset of the antenna. You can add an offset relative to port, center or starboard. When *port* or *starboard* is chosen, the offset value will move the position towards the opposite side and when *center* is chosen a positive value will move it towards starboard and a negative value towards port.

6.2.2 Heading offset

CAT MAX allows for independent heading which requires you to enter a heading offset based on the position of the antennas.

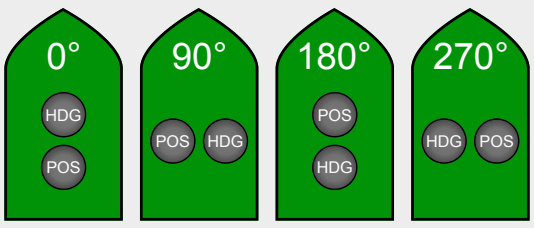

Figure 6.2: GPS antenna offset value relative to its positioning.

6.3 Notes

You may add notes to a vessel for current and future operations. If SafePilot is connected to a Port Server, these notes will be shared with other pilots connected to the same server. Select the *Notes* field to get to the list of notes, see fig. 6.3. In the list, click the first, empty row to create a new note. While editing you may tap the exclamation marks to mark this note as high priority. Notes can be sorted by priority or date by clicking the buttons at the top of the page. To delete a note, drag it to the left.

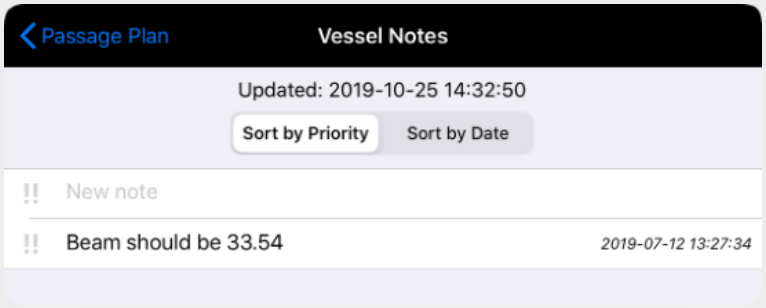

Figure 6.3: The vessel notes dialog with one note.

6.4 Route

You may select a route for the operation directly from the *Passage Plan*. See more about routes in section 8.1.1 on page 19 and in section 8.2 on page 21.

7 Vessel details

7.1 Own vessel

7.1.1 Navigational data

The basic navigational data for your vessel is always displayed in the *Top Panel* as described in section 4.1 on page 11. Further information may be displayed in other panels based on the active context.

Note 7.1-1
It is possible to adjust own vessel heading by tapping in the heading field within the *Top Panel*.

7.1.2 Live vessel predictions

Advanced vessel movement predictions are always available for vessels with an installed SafePilotor SafeTugsystem onboard. This includes vessels connected to a Data Server. The prediction is a projection of the position and heading based on the current position, COG, SOG and ROT. It is activated by default but can be deactivated and modified in the *Motion* tab within the *Control Center*. The *Control Center* is explained in section 11 on page 27.

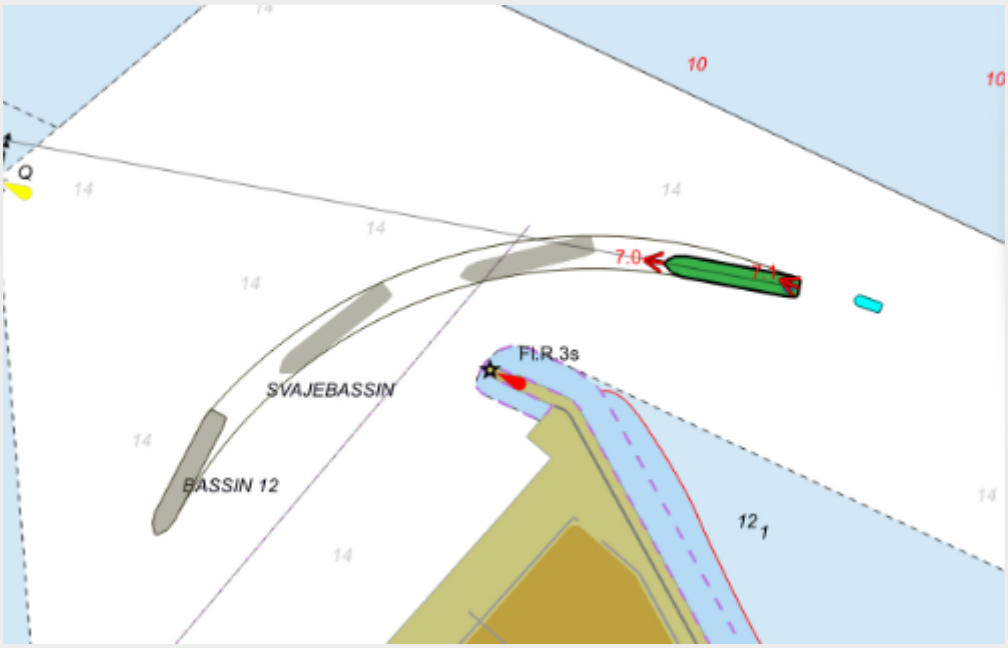

Figure 7.1: Tanker with prediction shapes.

7.1.3 Conning Position

The conning position is used as origin for most position related calculations throughout SafePilot. It is determined by the following prioritized rules:

1. If the reference position is set in the *Vessel Setup*, the conning position is on the center line with the given offset from the bow.
2. If a ship shape is drawn, the conning position is on the center line of the ship at the antenna's length offset from the bow.
3. Otherwise, the antenna location is used as the conning position.

The conning position used for all navigational and positioning calculations which include the following:

- BCR
- BCT
- COG
- CPA
- EBL/VRM
- Meeting points
- Motion vectors
- Passing waypoints
- Ranges
- SOG
- TCPA

7.1.4 Electronic bearing line and variable range marker

An EBL/VRM can be added in three modes: *static*, *following* and *observing*. See section 8.1.3 on page 19 for details about the *static* mode.

The *following* mode will follow own vessel during navigation and will always point in the same direction no matter how the vessel moves. The EBL and VRM will appear by dragging from the center of own vessel in any direction. EBL/VRM can be edited by dragging in the junction or individually by dragging one of them.

You may observe a point on the chart by long pressing on any location. This will change the behavior of the EBL/VRM to display the information related to the point and your current location - during navigation.

For both *following* and *observing* mode you are able to change the origin of the EBL/VRM by dragging the marker above your own vessel. The following locations can be selected as origin: stern, conning, center, and bow.

Finally you may delete the EBL/VRM by tapping on the EBL/VRM lines.

7.1.5 Virtual anchors

You can use the *Drop Anchor* function to mark the location where an anchor was dropped. Long press on your vessel and select *Drop Anchor* to mark the location. You may drop an arbitrary number of anchors. Tapping on an anchor brings up information about distance, bearing and TTG for that particular anchor. Anchors are persisted between sessions. To remove an anchor long press on it and select *Delete Dropped Anchor*.

7.1.6 REAL TIME UNDER KEEL CLEARANCE

Normal under keel clearance (UKC) will calculate the UKC based on a fixed draught depth, the chart data and maybe some tide sensor data. But, it does not take into account the actual movements of the vessel.

This is what Realtime Under Keel Clearance (RUKC) does. It is defined as: *The smallest vertical distance between the vessel keel and known survey points.* This requires high precision movement data and are therefore only available for our top CAT devices.

Activation of RUKC
Install the depth files files into SafePilot, see section 12.3.2 on page 31 and make sure to set all required vessel details:

- MMSI
- length
- beam
- length offset
- beam offset
- heading offsets
- keel offset

The RUKC will be shown in the vessel infobox.

7.2 Other vessels

7.2.1 AIS VESSELS

AIS targets are displayed with true shape when width, length and heading are available. If any of the data are missing, the AIS target will be displayed as a • symbol indicating the position or a triangle if the heading is available. If the heading is missing SafePilot assumes that HDG is the same as COG and the vessel shape will appear as a transparent ghost shape. If both HDG and COG are missing the transparent ghost shape of the vessel will have a HDG of zero degrees (pointing north) but is still drawn with actual size on the chart. Detailed AIS target information can be accessed by tapping on the vessel. The size of the infobox can be changed inside *Settings app*. In *Settings app* you can choose to show certain ship types with reduced detail to reduce clutter. These will be shown with a smaller symbol, no name and no motion vector.

7.2.2 STATIC VESSEL PREDICTIONS

The static vessel prediction is accessed by tapping on the clock in the lower right corner. This tool allow you to estimate where the vessel will be at a later point in time, according to the chosen value on the 'Length' slider. The prediction applies to all known vessels, which are predicted from the last known location, direction, and their current speed, for up to the next 60 minutes. You can change how this is shown on the screen by switching between the two modes. One mode moves the vessels and draws dashed lines from their original positions. The other mode keeps the vessels in their original positions and instead scales their motion vectors.

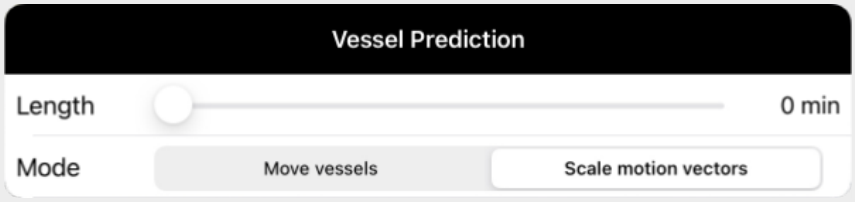

Figure 7.2: Static vessel prediction configuration dialog.

7.2.3 VIRTUAL BOARDING

You are able to virtually embark any vessel to pretend you are assisting it or to help a colleague observing the vessel. By long pressing on another vessel you may select *Embark*. All instruments and calculations will now act as if the other vessel were your own vessel and a blinking V will be shown in the upper left corner of the display. To return to your actual own vessel long press the vessel again and select *Disembark*.

8 Contexts

The *Contexts Panel* includes all the contexts in a *Context Wheel*. Each context will be explained in this chapter. Some of the contexts may include a *Tools Panel* as explained in section 4.3 on page 11.

8.1 The planning context

The planning context is used to plan and/or select a route to follow or to add special areas and annotations to the chart. All additions can only be edited while in this context to prevent unintended changes during operation. You have multiple tools available in the *Tools Panel* to help you create the chart elements which are described in this chapter.

8.1.1 The route tool

The route tool is used to plan the route to follow. If a proper route already exists, tap on it to activate it. When it has been activated it will be used in the navigation context - see section 8.2 on page 21. Follow these steps to create a new route:

1. Make sure that no other routes are selected by tapping on an empty location in the chart.
2. Now long press on the chart to add your first waypoint.
3. To add another waypoint simply navigate to the new location and long press on it.

You should see a line connecting the two points. Continue until your route is complete. You can move a waypoint by dragging it and turns may also be adjusted by dragging the corresponding handle. Finally, long press on any waypoint to access advanced configurations for both the waypoint and the entire route. The configurations include:

- Max cross track distance.
- Speed limits.
- Wheel over points.
- Naming of waypoints and routes.
- Deletion of waypoints and routes.

8.1.2 The fender line tool

This tool is used to add fender lines to the chart. These are used in the docking context to measure distances to the fender. Long press on the chart to add the start of the fender line and again to add the end. You may drag the points to move it, long press on a fender line to add a manifold position or long press on a fender point to edit details or delete it. See section 8.3 on page 22 for more details.

8.1.3 The EBL/VRM tool

This tool is used to add an electronic bearing line and variable range marker. Long press on the chart to add the marker and drag the outline and the line to set the range and bearing. Long press again to edit details or to delete it.

8.1.4 THE ANNOTATION TOOL

This tool is used to annotate areas of interest by giving them a title, description and color. Annotations can be added as circles or polygons. On tool selection you will choose either the polygon option or the circle option. Long press on the chart to add an annotation and drag its components. Long press on the annotation to edit details or to delete it.

8.1.5 THE DISTANCE LINE TOOL

This tool is used to add distance measurements from your vessel to the line. Only the closest distance line to each side will be active during navigation and only when it is closer than 500 meters and you are moving towards it and is always shown when closer than 200 meters. Long press on the chart to add a new line and drag the points to move it. Long press again to edit details or to delete it.

Note 8.1-1

Distance lines will also be shown for closest vessels within 500 meters. They will get precedence if they come closer than the distance line. The only exception are vessels with reduced details which will be ignored.

8.1.6 THE LOCK TOOL

This tool is used to add locks to the chart which are used in the lock context (see section 8.6 on page 23). Long press on the chart to add a lock. All elements of the lock can be adjusted by dragging the elements. Multiple gates may be added by long pressing inside of the lock. Finally, the gate thicknesses may by entered by long pressing on the gate. Long press on the lock to edit details or to delete it.

8.1.7 THE TURNING BASIN TOOL

This tool is used to add a turning basing which is used in the turning basin context context (see section 8.4 on page 23). It will add distance measurements from the vessel to the center and perimeter of the turning basin. Long press on the chart to add a turning basing. Drag it to edit the size and long press it to edit details and to delete it.

8.1.8 THE PARALLEL INDEX TOOL

This tool is used to add Parallel Index lines on top of charts.

Long pressing on a location on the screen creates a starting point (”fix point”) for the line, and long pressing on a different location afterwards creates a thick line between the starting point and the end point. By dragging the starting point you can move the Parallel Index line to a different location, and by dragging the end point you can change the direction of the line relative to the starting point. If you long press on an existing Parallel Index line you can add parallel index distance lines originating from the primary line. These lines can also be changed to ”Safety Distance” lines by long pressing on the end point of the distance line and changing its type.

If you long press on the starting point of the Parallel Index line a popover will appear allowing for precise numerical entry, naming, and deletion.

Parallel Index lines can be viewed while in the navigation context by enabling them from the *Control Center* (see section 11 on page 27).

8.2 The navigation context

The navigation context is used during navigation along a route. A bottom bar will present the most crucial information for the route. This includes distance, bearing, ETA and XTD for both the next waypoint and the destination waypoint. See an example in fig. 8.1.

Figure 8.1: The bottom bar which appears in the navigation context.

Detailed ETA and TTG information can be inspected by tapping on either the next waypoint box or the destination waypoint box in the bar. By tapping on the next waypoint box you will see information related to this waypoint only. By tapping on the destination waypoint box you will see information related to the destination and all intermediate waypoints.

8.2.1 Route symbols

A route consists of multiple waypoints where each waypoint can be shown as different symbols based on the type of waypoint and location relative to the vessel. The symbols are as following:

- Passed waypoint.
- Next waypoint.
- Upcoming waypoint located after next waypoint.
- Destination waypoint.
- Waypoint after destination.

The default destination is the last waypoint along the route. To change the destination long press on the desired waypoint and select *Set as destination*. Here you can also set it as the next waypoint to skip another waypoint or set a target ETA. In this case, an infobox will display the recommended speed to reach the waypoint in time.

8.2.2 Meeting points

Meeting points can be enabled manually for each vessel or automatically for all vessels along your route. To automatically show meeting points you can enable the setting in the *Motion* tab in the *Control Center*. To add a meeting point manually long press on a vessel and select *Enable Meeting Point*. A meeting point indicator will appear on the route where the vessels are expected to meet. The name and SOG for the other vessel is shown along with ETA and DTG for the meeting point. If you tap on the meeting point indicator an infobox will appear. Manually added meeting points can be removed by long pressing on the meeting point or the target vessel and choosing *Disable meeting point*.

8.2.3 Assisted meeting points

Assisted meeting points works like ordinary meeting points but are used in a case where the other vessel does not follow your route. For vessels not following your route you shall add the expected merge point of where you expect the two vessels to merge routes.

8.2.4 Speed recommendations

A speed recommendation will show you the speed required to reach a waypoint at a specific ETA. When you set the target ETA for a waypoint you will get speed recommendations in the infobox.

For meeting points you have to drag the meeting point along the route to create a target meeting point. An infobox will then show you the speed recommendation. The target meeting point will have a blue outline to distinguish it from the estimated meeting point.

8.2.5 Closest Point of Approach

The CPA for another vessel can be visualized in the chart by long pressing on the vessel and selecting *Enable CPA*. Dashed lines will extend the course vectors from the two ships, a solid red line will mark the CPA, and an infobox will show details on the CPA and TCPA. Tap on the infobox to deactivate the CPA visualization.

8.2.6 Bow Crossing

The values for bow crossing for another vessel can be visualized in the chart by long pressing on the vessel and selecting *Bow crossing*. Dashed lines will extend the course vectors from the two vessels, crossing where the other vessel will cross your course line, and an infobox will show details on the BCR and BCT. Tap on the infobox to deactivate the visualization.

8.3 The docking context

The docking context shows the most relevant information while docking to a fender. Distances and speeds for bow and stern will be displayed in the *Tools Panel* as well as the angle from the vessel to the fender line. The chart will also show where the distances for bow and stern applies. If multiple fender lines exist the nearest will be selected. In some cases you may want to manually select another fender line. This is done by tapping on the desired fender line.

Note 8.3-2
The distances are calculated from the orthogonal angles from the fender line and the transverse speeds are relative to the center line of the vessel.

8.4 The turning basin context

The turning basin context has been optimized to show the most relevant information while turning in narrow areas. The *Tools Panel* displays transverse and longitudinal speeds together with the shortest distances forward and backward to the turning basin circle.

Note 8.4-3
All calculations are done from the center of the vessel - and not from the conning position as for other contexts. This is also indicated by the (center) notations on the SOG and COG instruments in the top bar.

8.5 The multi buoy mooring context

The multi buoy mooring context shows several visual navigational aids related to multi buoy mooring operations. These include *Anchor Drop Zones*, *Aproach Lines*, and a *Target Vessel Position*, which together are refered to as *Berths*. Figure fig. 8.2 shows what these look like in SafePilot.

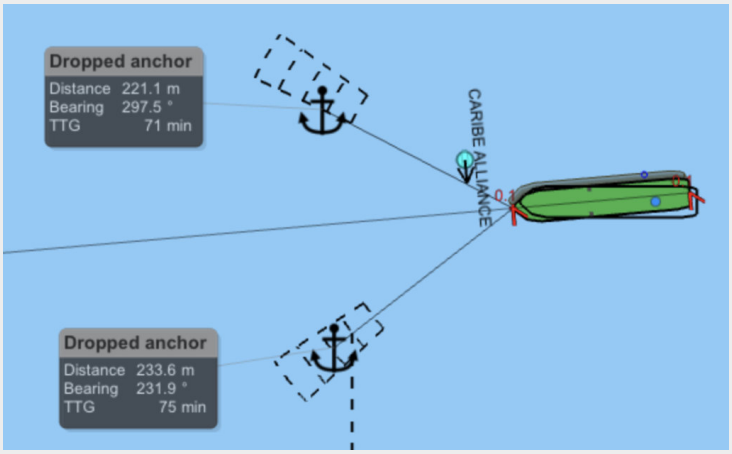

Figure 8.2: A multi buoy mooring operation with two dropped anchors.

Note 8.5-4
These aids cannot be added from SafePilot but should be downloaded from a Port Server or manually installed on the iPad.

In case of several berths, a specific one can be highlighted by tapping on the corresponding anchor drop zone or the target vessel position. This dims all other berths from view to help focus on the selected berth. Tapping a different berth will switch the active berth. To deselect, tap the current active berth either on the anchor drop zone or on the target vessel position.

8.6 The lock context

The lock context shows the most relevant information while approaching and navigating through a lock. The *Tools Panel* displays transverse and longitudinal speeds along with the angle to the center line of the lock.

The gates can be opened and closed by tapping in the orange symbols on the gate. This affects the forward and backward distances as they are calculated to the nearest locked gate.

If multiple locks exist the nearest will be selected.

9 Recording and Replaying

9.1 AIS recording

All vessel movements are recorded automatically for every operation and saved in separate files for later replay. You can access these recordings from the Replay Panel which is initially hidden at the bottom of the screen. You can make it appear/disappear by either tapping or dragging the visible flap.

To replay a recording of a previous operation, tap the Recording List icon on the panel's right side to see all available recordings and select the recordings you wish to see. A blinking replay symbol will be visible in the top left corner of the screen to indicate that a previous recording is being replayed. You can use the controls on the replay panel to slow down, speed up, or jump in time in the recording.

WARNING 9.1-1

If you start a replay in the middle of an active operation the recording of vessel movements will stop and no data will be saved while replaying. Also, when resuming the active operation again, a new recording will be created, and the operation will then consist of two recordings.

Figure 9.1: A recording being replayed, indicated by the blinking replay symbol in the top left corner.

9.2 Voice recordings

With Feature Pack 22, voice recording is also available, but is disabled by default. To enable voice recordings, go to the app settings (*Home screen* → *Settings* → *SafePilot*) and scroll to the "Audio" section. From here you can enable or disable voice recordings.

With voice recording enabled, SafePilot will automatically record audio in the iPad's vicinity or through

a connected microphone together with the vessel movements. These voice recordings are also stored in seperate files with the ".aac" extention, but matches the name of the vessel movements recording. If a voice recording exists for a stored recording, it will automatically be replayed together with the vessel movements when selecting the recording from the Recording List. If you do not wish to listen to the voice recording when replaying, you can tap the mute button on the replay panel to toggle the audio playback.

Note 9.2-2

When a recording has been started the iPad will continue to record audio even if another app is opened instead of SafePilot or the iPad's screen is turned off (locking the iPad). The recording will continue for 15 mins after data has stopped being received (after disconnecting from the CAT device). You can stop recording audio manually by either disabling voice recording from the settings, or by closing SafePilot entirely (this also stops recording of vessel movements).

10 Fullscreen displays

Fullscreen displays are available for some contexts like navigation, docking and lock. Tap on the side panel on the right-hand side to bring up the fullscreen displays related to the current context. If the context contains multiple fullscreens you will be able to swipe to the side to access them within any fullscreen view.

Figure 10.1: Some fullscreens: top left: docking, top right: in a lock, bottom left: simple navigation and bottom right: detailed navigation.

11 Control center

The *Control Center* is located last in the *Contexts Panel* as a *Gear* icon. It controls the most used options and displays among other things server connection statuses and license information.

11.1 Display settings

In this dialog you may alter the visual aspects of SafePilot and the content of the charts. Figure 11.1 shows a sample of this dialog.

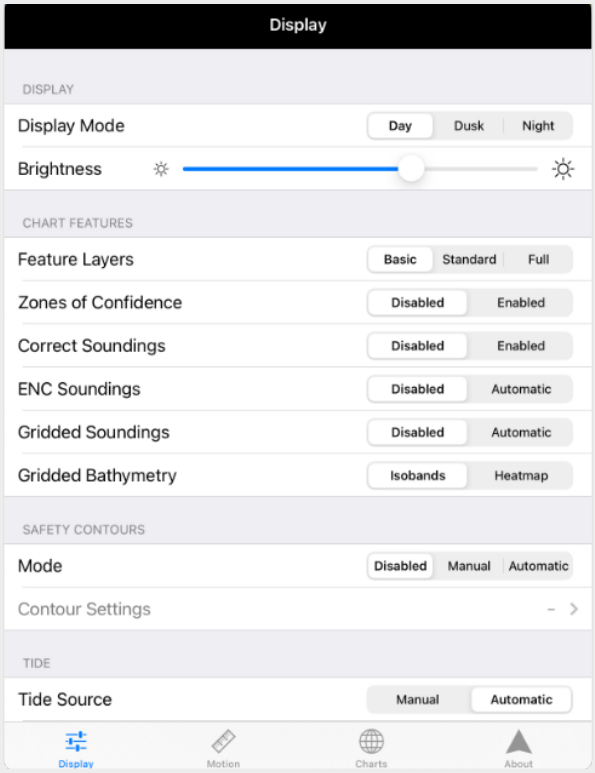

Figure 11.1: A sample of the display settings dialog in SafePilot.

11.1.1 Display

Here you may change from day, to dusk, to night mode as well as adjusting the overall brightness.

11.1.2 Chart features

Feature layers
Choose between: Basic, Standard and Full to show more or less details in the chart. Appendix B on page 35 tells exactly what is included in the three feature options.

Zones of confidence
Enable zones of confidence to get an understanding of the quality of surveyed data in the charts. A legend in the lower left corner will map each color to a quality level. Details about the quality levels are available in appendix D on page 39.

Correct soundings
This will correct soundings based on actual tide level.

ENC soundings
Displays soundings from ENC charts if available.

Gridded soundings
Displays soundings from S-102 charts and XYZ charts if available.

Gridded bathymetry
Toggle between traditional isoband represenation and heatmap representation for S-102 charts.

11.1.3 Safety contours

Safety contours are a way of indicating where it is safe to navigate and where it's too shallow. It works by highlighting soundings and depth contours that are separated by certain thresholds.

Deep soundings are shown as faded gray, safe soundings as black and shallow soundings as red. Depth contours between deep and safe areas are colored black and depth contours between safe and shallow areas are colored red.

The safety contours thresholds can be configured either as fixed depths, or calculated based on your under keel clearance or a percentage of your draught.

11.1.4 TIDE

Use tide levels from the Data Server or a tide table or set the current tide level manually.

11.1.5 PARALLEL INDEX

Display Parallel Index lines while in the navigation context.

11.1.6 SHAPE FILE COUNTOUR

Highlight the Shape File Countour depth line in the chart from shape files if available.

11.2 Motion

This tab includes settings for vessel movements and predictions. Figure 11.2 shows a sample of this dialog.

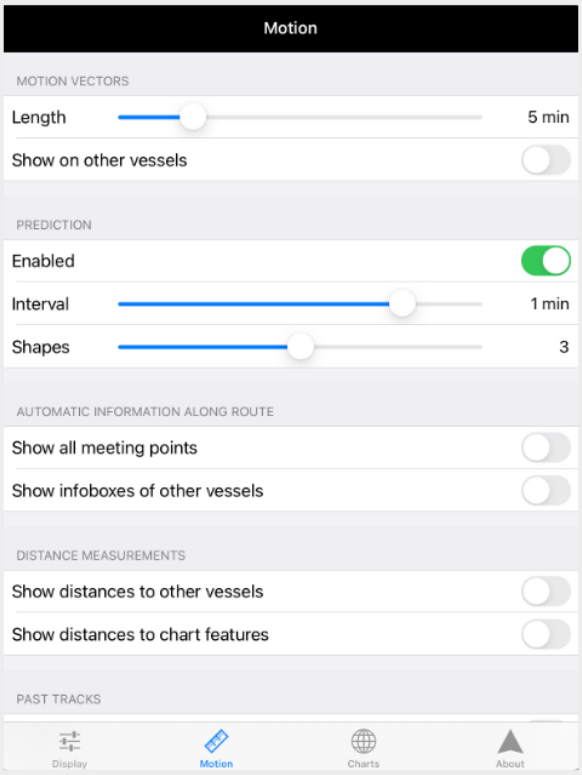

Figure 11.2: The motion settings dialog in SafePilot.

11.2.1 Motion vectors

A motion vector can be added to your vessel alone or all vessels. It will add one motion vector from your conning position based on SOG and COG. If your own vessel is moving slower than 5 knots or is turning more than 10 °/min, two motion vectors will be shown, one from the bow and one from the stern. All other vessels will only show one motion vector which will originate from their conning position if the required information are available and otherwise from their antenna position.

11.2.2 Prediction

This will predict the location of your own vessel as well as other SafePilot vessels received through the Data Server. It is shown as a shadow next to the current vessel location. You can change the interval between the shapes and the number of shapes.

11.2.3 Automatic information along route

Show all meeting points
This will show meeting points for all other ships around your current route. The only exception is ships with a SOG below 1 knot.

Show infoboxes of other vessels
This will automatically display the infobox for other vessels as long as the following criteria are fulfilled:

1. The other vessel has to be moving.
2. The other vessel has to be closer than ≈1800 meters front or behind and closer than ≈350 meters to the sides.

11.2.4 Distance measurements

Show distances to other vessels
This will toggle distance to other vessels.

Show distances to chart features
When enabled, shows the shortest measurement against a range of chart features. The chart features includes dredged areas, land areas, wrecks, obstructions, mooring/warping facilities, and more. The shortest distance from both the port and starboard side of the vessel to the feature is measured and displayed in the chart.

11.2.5 PAST TRACK

You can show past tracks of your own vessel as well as other vessels. The track can be displayed as either a line or a series of ship shapes and it automatically disappears after a chosen interval.

11.2.6 ALERTS

Speed alerts
You may enable an audible and visible warning on transverse docking speeds. If either bow or stern speed exceeds the set limit, the relevant number will be colored amber, and an audio alert will sound.

Distance alert
A distance warning can be enabled to trigger if the docking or lock distance is less than the chosen value.

11.3 Server

This tab shows if you are connected to a Data Server and/or Port Server. You can see the server addresses and enable or disable the internet AIS stream to receive AIS vessels from the Data Server.

11.4 Charts

This tab informs about installed charts. Tap on a chart for detailed information like title, edition and expiry date. See more details about installing charts in section 12 on the next page.

11.5 About

The tab shows detailed license information like what is included and the ENC user permit used to purchase charts. It also links to our customer support and this manual.

12 Charts

SafePilot supports charts from different vendors. PRIMAR and NOAA charts can be installed automatically or manually based on your preferences. But, charts from other vendors has to be installed manually. All charts can be used alone or in combination as your prefer.

12.1 PRIMAR charts

SafePilot supports ENC charts from PRIMAR. If your user permit is added to your chart order, the charts will automatically be downloaded and installed into SafePilot. The user permit is displayed in the *About* tab in the *Control Center* in section 11.5 on the preceding page. SafePilot will automatically check for chart updates and notify you, when new charts are ready to be installed.

12.2 NOAA charts

SafePilot also supports ENC charts from NOAA. You have three options to install NOAA charts:

1. Using SafePilot Shore Viewer together with a Port Server to select and distribute charts to all pilots.
2. Manually install charts or chart IDs onto the Port Server.
3. Manually install charts or chart IDs into SafePilot.

12.2.1 Define NOAA chart IDs for manual installation

Please contact our support team by email It you want to manually create a file with NOAA chart IDs. It is a simple process but hard to describe so they will be happy to assist you.

12.3 Distribute charts to all users

You may choose to use SafePilot Cloud to distribute your own charts to all users of your organization. Upload the file to SafePilot Cloud to distribute these files. These charts may also be installed manually on each iPad, see section 12.4.

12.3.1 Bathymetric Inland Electronic Navigational Charts

SafePilot supports bIENC. These charts are typically created from frequently updated, high resolution survey data and represents only the seabed. They are more detailed and accurate than ENC charts. As bIENCs are designed to complement traditional ENCs and inland ENCs, they are only visible where they overlap such charts. Furthermore, they must have the underlying ENCs'/IENCs' intended usage level set in their range of supported usage levels. More information is available in the bIENC product specification at http://ienc.openecdis.org/content/bathymetric-inland-enc-product-specification.

12.3.2 RUKC charts

RUKC uses chart files of the type sasc. It is a standard asc file with a custom SafePilot header in the top. See more about the format in appendix C on page 38.

12.4 Manual installation of charts

Downloaded charts can be installed into SafePilot. All charts should be installed directly into *SafePilot Documents* directory. See section 13 on the next page for details about the installation and extraction process of files.

13 File handling

You may extract or install charts and configuration files manually into SafePilot. This includes the following:

- Annotations (.san)
- Charts (.000, .gml, .prm, .s63, .xyz and .zip)
- Display scheme overwrites (.json)
- Distance lines (.sdl)
- Fender lines (.sfl)
- Locks (.slo)
- Recordings (.log and .ukc)
- Routes (.spx)
- Shapes (.dbf, .prj, .shp and .shx)
- Soundings (.sasc)

All files should be installed in either the root of the document folder or in a subdirectory if it exists.

13.1 Access the SafePilot documents folder of the iPad

The steps varies a bit depending on which operative system you are running on your pc.

13.1.1 MacOS until version 10.14 (Mojave) or Windows

You can connect a computer to the iPad via iTunes which you can download free from Apples website at: `https://www.apple.com/itunes/`.

Follow these steps to enter the document folder on the iPad on MacOS versions:

1. Connect the iPad to the computer with a cable.
2. Open iTunes on the computer.
3. Select the *iPad*.
4. Click on *File sharing*.
5. Select SafePilot in the list.

You may now extract or install files directly into SafePilot by dragging items or using the *Add...* button.

13.1.2 MacOS from version 10.15 (Catalina)

You are able to access the files on the iPad directly through finder like this:

1. Connect the iPad to the computer with a cable.
2. Open finder on the computer.
3. Select the *iPad*.
4. Click on *Files*.
5. Select SafePilot in the list.

You may now extract or install files directly into SafePilot by dragging items.

Appendices

A Master/Pilot exchange form

This chapter goes into details about the workflow of the MPX in SafePilot.

A.1 The MPX workflow in SafePilot

A typical MPX workflow is show in fig. A.1. A job is usually pushed from the SafePilot Cloud and assigned to one or more pilots. The pilot will automatically receive the job within SafePilot and may inspect the operation details before boarding.

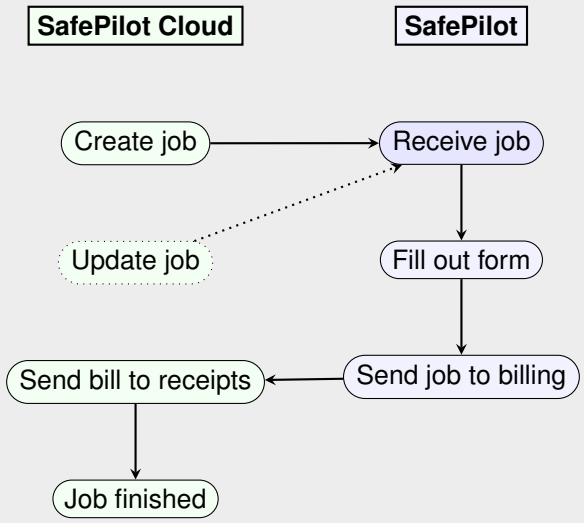

Figure A.1: A sample MPX workflow

Once onboard the vessel the pilot will make any required changes to the form and fill out remaining fields. When the form is complete the master and pilot will both sign the form.

When the operation is completed the pilot will send in the job to SafePilot Cloud to be administered. Here, the job will be billed to the appointed client and the master and pilot will receive a receipt for the completed job by email.

A.2 Jobs

The *Job List* shows all available jobs and are accessed through the *Passage Plan*. All jobs are synchronized every minute and may manually be synchronized by tapping on the circling arrows.

Note 1.2-1
If no jobs can be downloaded it may be created manually by tapping on *New job*. It will be uploaded to SafePilot Cloud later when an active internet connection is available.

The synchronization status of each job are indicated by a symbol which are described in table A.1.

- Pending update from SafePilot Cloud.
- Pending upload to SafePilot Cloud.
- In sync with SafePilot Cloud.
- You have made changes to an already uploaded job.

Table A.1: Description of the MPX job status icons.

A.2.1 Job actions

Each job has the following available options:

Activate	This will transfer the current vessel particulars to the vessel setup.
Deactivate	This will clear the vessel particulars from the vessel setup.
Send to billing	This finalizes the job and sends it to SafePilot Cloud.
Download update	This downloads changes from SafePilot Cloud to your job description.
Send to mail	This will send the job description as a mail if you have a configured mail client on your iPad.
Delete	This will delete the job only from your iPad.

A.2.2 Job details

When a job has been selected all details for both the current vessel particulars and additional fields will be revealed. The additional fields may vary based on your organization setup but may include fields for pilot name and signature, start and finish times and selected route. Some fields will be optional and some mandatory. The mandatory fields will display a warning icon if not filled out. You can also access the job actions described in appendix A.2.1 directly from this dialog.

B Feature layer sets

As described in section 11.1.2 on page 27 you can choose between displaying only the basic chart features, the standard features or all features. What exactly is included in the different sets are explained in the following sections.

B.1 The basic feature set

This set includes a minimal set of chart features which are:

- Bridge (*BRIDGE*)
- Built-up area (*BUAARE*)
- Canal (*CANALS*)
- Causeway (*CAUSWY*)
- Coastline (*COALNE*)
- Depth area (*DEPARE*)
- Depth contour (*DEPCNT*)
- Dredged area (*DRGARE*)
- Floating dock (*FLODOC*)
- Gate (*GATCON*)
- Hulk (*HULKES*)
- Lake (*LAKARE*)
- Land area (*LNDARE*)
- Pontoon (*PONTON*)
- River (*RIVERS*)
- Shoreline construction (*SLCONS*)
- Unsurveyed area (*UNSARE*)

B.2 The standard feature set

This set includes the most used chart features. It consists of all features from the basic feature set and the following:

- Anchor berth (*ACHBRT*)
- Anchorage area (*ACHARE*)
- Beacon, cardinal (*BCNCAR*)
- Beacon, isolated danger (*BCNISD*)
- Beacon, lateral (*BCNLAT*)
- Beacon, safe water (*BCNSAW*)
- Beacon, special purpose/general (*BCNSPP*)
- Berth (*BERTHS*)
- Building, single (*BUISGL*)
- Buoy, cardinal (*BOYCAR*)
- Buoy, installation (*BOYINB*)
- Buoy, isolated danger (*BOYISD*)
- Buoy, lateral (*BOYLAT*)
- Buoy, safe water (*BOYSAW*)
- Buoy, special purpose/general (*BOYSPP*)
- Cable area (*CBLARE*)
- Cable, overhead (*CBLOHD*)
- Cable, submarine (*CBLSUB*)
- Cargo transhipment area (*CTSARE*)
- Caution area (*CTNARE*)
- Conveyor (*CONVYR*)
- Dam (*DAMCON*)
- Daymark (*DAYMAR*)
- Deep water route centerline (*DWRTCL*)
- Deep water route part (*DWRTPT*)
- Distance mark (*DISMAR*)
- Dock area (*DOCARE*)
- Dry dock (*DRYDOC*)
- Dumping ground (*DMPGRD*)
- Fairway (*FAIRWY*)
- Fence/wall (*FNCLNE*)
- Fishing facility (*FSHFAC*)

- Fog signal (*FOGSIG*)
- Harbour facility (*HRBFAC*)
- Ice area (*ICEARE*)
- Land region (*LNDRGN*)
- Landmark (*LNDMRK*)
- Light (*LIGHTS*)
- Light float (*LITFLT*)
- Light vessel (*LITVES*)
- Lock basin (*LOKBSN*)
- Log pond (*LOGPON*)
- Marine farm/culture (*MARCUL*)
- Military practice area (*MIPARE*)
- Mooring/Warping facility (*MORFAC*)
- Navigation line (*NAVLNE*)
- Obstruction (*OBSTRN*)
- Offshore platform (*OFSPLF*)
- Pile (*PILPNT*)
- Pilot boarding place (*PILBOP*)
- Pipeline area (*PIPARE*)
- Pipeline, overhead (*PIPOHD*)
- Pipeline, submarine/on land (*PIPSOL*)
- Precautionary area (*PRCARE*)
- Pylon/bridge support (*PYLONS*)
- Radar transponder beacon (*RTPBCN*)
- Radio calling-in point (*RDOCAL*)
- Railway (*RAILWY*)
- Recommended route centerline (*RCRTCL*)
- Recommended track (*RECTRC*)
- Recommended traffic lane part (*RCTLPT*)
- Restricted area (*RESARE*)
- Road (*ROADWY*)
- Sea area/named water area (*SEAARE*)
- Seabed area (*SBDARE*)
- Sounding (*SOUNDG*)
- Submarine transit lane (*SUBTLN*)
- Topmark (*TOPMAR*)
- Traffic separation line (*TSELNE*)
- Traffic separation scheme boundary (*TSSBND*)
- Traffic separation scheme crossing (*TSSCRS*)
- Traffic separation scheme lane part (*TSSLPT*)
- Traffic separation scheme roundabout (*TSSRON*)
- Traffic separation zone (*TSEZNE*)
- Two-way route part (*TWRTPT*)
- Underwater/awash rock (*UWTROC*)
- Water turbulence (*WATTUR*)
- Wreck (*WRECKS*)

B.3 The full feature set

This set includes all chart features. It consists of all features from the basic and standard feature sets and the following:

- Accuracy of data (*M_ACCY*)
- Administration Area (Named) (*ADMARE*)
- Airport/airfield (*AIRARE*)
- Archipelagic Sea Lane (*ARCSLN*)
- Archipelagic Sea Lane axis (*ASLXIS*)
- Checkpoint (*CHKPNT*)
- Coastguard station (*CGUSTA*)
- Compilation scale of data (*M_CSCL*)
- Contiguous zone (*CONZNE*)
- Continental shelf area (*COSARE*)
- Control point (*CTRPNT*)
- Coverage (*M_COVR*)

- Crane (*CRANES*)
- Current - non-gravitational (*CURENT*)
- Custom zone (*CUSZNE*)
- Dyke (*DYKCON*)
- Exclusive economic zone (*EXEZNE*)
- Ferry route (*FERYRT*)
- Fishery zone (*FSHZNE*)
- Fishing ground (*FSHGRD*)
- Fortified structure (*FORSTC*)
- Free port area (*FRPARE*)
- Gridiron (*GRIDRN*)
- Harbour area (administrative) (*HRBARE*)
- Horizontal datum shift parameters (*M_HOPA*)
- Incineration area (*ICNARE*)
- Inshore traffic zone (*ISTZNE*)
- Land elevation (*LNDELV*)
- Local magnetic anomaly (*LOCMAG*)
- Magnetic variation (*MAGVAR*)
- Nautical publication information (*M_NPUB*)
- Navigational system of marks (*M_NSYS*)
- Offshore production area (*OSPARE*)
- Oil barrier (*OILBAR*)
- Production/storage area (*PRDARE*)
- Radar line (*RADLNE*)
- Radar range (*RADRNG*)
- Radar reflector (*RADRFL*)
- Radar station (*RADSTA*)
- Radio station (*RDOSTA*)
- Rapids (*RAPIDS*)
- Rescue station (*RSCSTA*)
- Runway (*RUNWAY*)
- Sand waves (*SNDWAV*)
- Sea-plane landing area (*SPLARE*)
- Signal station, traffic (*SISTAT*)
- Signal station, warning (*SISTAW*)
- Silo/tank (*SILTNK*)
- Slope topline (*SLOTOP*)
- Sloping ground (*SLOGRD*)
- Small craft facility (*SMCFAC*)
- Sounding datum (*M_SDAT*)
- Spring (*SPRING*)
- Straight territorial sea baseline (*STSLNE*)
- Survey reliability (*M_SREL*)
- Swept Area (*SWPARE*)
- Territorial sea area (*TESARE*)
- Tidal stream - flood/ebb (*TS_FEB*)
- Tidal stream - harmonic prediction (*TS_PRH*)
- Tidal stream - non-harmonic prediction (*TS_PNH*)
- Tidal stream - time series (*TS_TIS*)
- Tidal stream panel data (*TS_PAD*)
- Tide - harmonic prediction (*T_HMON*)
- Tide - non-harmonic prediction (*T_NHMN*)
- Tide - time series (*T_TIMS*)
- Tideway (*TIDEWY*)
- Tunnel (*TUNNEL*)
- Unsurveyed area (*UNSARE*)
- Vegetation (*VEGATN*)
- Vertical datum of data (*M_VDAT*)
- Waterfall (*WATFAL*)
- Weed/Kelp (*WEDKLP*)

C The sasc file format

The sasc file is a deviation of the asc file. The asc file contains UTM coordinates and survey depths in the format:

$$<EASTING>, <NORTHING>, <DEPTH>$$

The $<DEPTH>$ is the height in meters, so for depths the value will be negative.

The header is:
UTMZone $<$*UTMZONE NUMBER*$>$ $<$*UTMZONE HEMISPHERE*$>$
DataBegin

Where *$<$*UTMZONE NUMBER*$>$* is the UTM zone number (1-60) and *$<$*UTMZONE HEMISPHERE*$>$* is either *N* for northern hemisphere or *S* for southern hemisphere.

Here follows an example of the start of a sasc file:

UTMZone 32 N
DataBegin
630992.13,6170992.13,-16.54
630992.38,6170992.13,-16.56
630992.63,6170992.13,-16.54
630992.88,6170992.13,-16.54

D Categories of zones of confidence

SafePilot implements the same categorization standard as defined by S-57. The different areas are displayed as semi-transparent colored areas matching the standard of S-57. Table D.1 summarizes the area definitions.

ZOC	Position accuracy	Depth accuracy	Seafloor coverage	Typical survey characteristics
A1	± 5m $+5\%$ depth	± 0.5m $+1\%$ depth	Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey high position and depth accuracy achieved using DGPS or a minimum three high quality lines of position (LOP) and a multibeam, channel or mechanical sweep system.
A2	± 20m	± 1.0m $+2\%$ depth	Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder and a sonar or mechanical sweep system.
B	± 50m	± 1.0m $+2\%$ depth	Full seafloor coverage not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	Controlled, systematic survey achieving similar depth but lesser position accuracies than ZOCA2, using a modern survey echosounder, but no sonar or mechanical sweep system.
C	± 500m	± 2.0m $+5\%$ depth	Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data collected on an opportunity basis such as soundings on passage.
D	Worse than ZOC C	Worse than ZOC C	Full area search not achieved, large depth anomalies may be expected.	Poor quality data or data that cannot be quality assessed due to lack of information.
U	Unassessed - The quality of the bathymetric data has yet to be assessed.			

Table D.1: A summary of the area definitions for the zones of confidence definition by S-57.

TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

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facebook: TrelleborgMarineandInfrastructure
twitter: @TrelleborgMI
youtube.com/c/TrelleborgMarineInfrastructure
flickr.com/photos/marineandinfrastructure
linkedin.com/company/trelleborg-marine-and-infrastructure
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