FLIGHTZOOMER 1.5

RELAY SERVER REFERENCE

1 Contents

2 Disclaimer

While FlightZoomer offers fantastic features, the following operation rules are strictly to be followed:

- The system is intended for hobby usage.
- Be familiar with the operation of RC aircraft having 1kg flying weight or more.
- Use FlightZoomer only aboard a proved combination of RC equipment, airframe, flight controller, motors, propeller, battery and ESCs.
- Operate FlightZoomer strictly within the safety boundaries of any other used components.
- Operate FlightZoomer strictly within the boundaries of any local regulatory requirement.
- Fully respect any disclaimer and safety note which is associated with any other used component.

3 FlightZoomer Relay Server application reference

The FlightZoomer Relay Server application is a rather simple single-screen application.

For normal operation the application just needs to be started and that's it. The application runs unattended and will just shovel incoming sensor data to as many groundstations as connected. The data feed towards the groundstation can come from the sensor device, from the flight simulation feature or from the replay file feature. There is only one restriction: The data feed can only come from one source at the same time. And as soon as data is incoming from the sensor device, the other sources are deactivated.
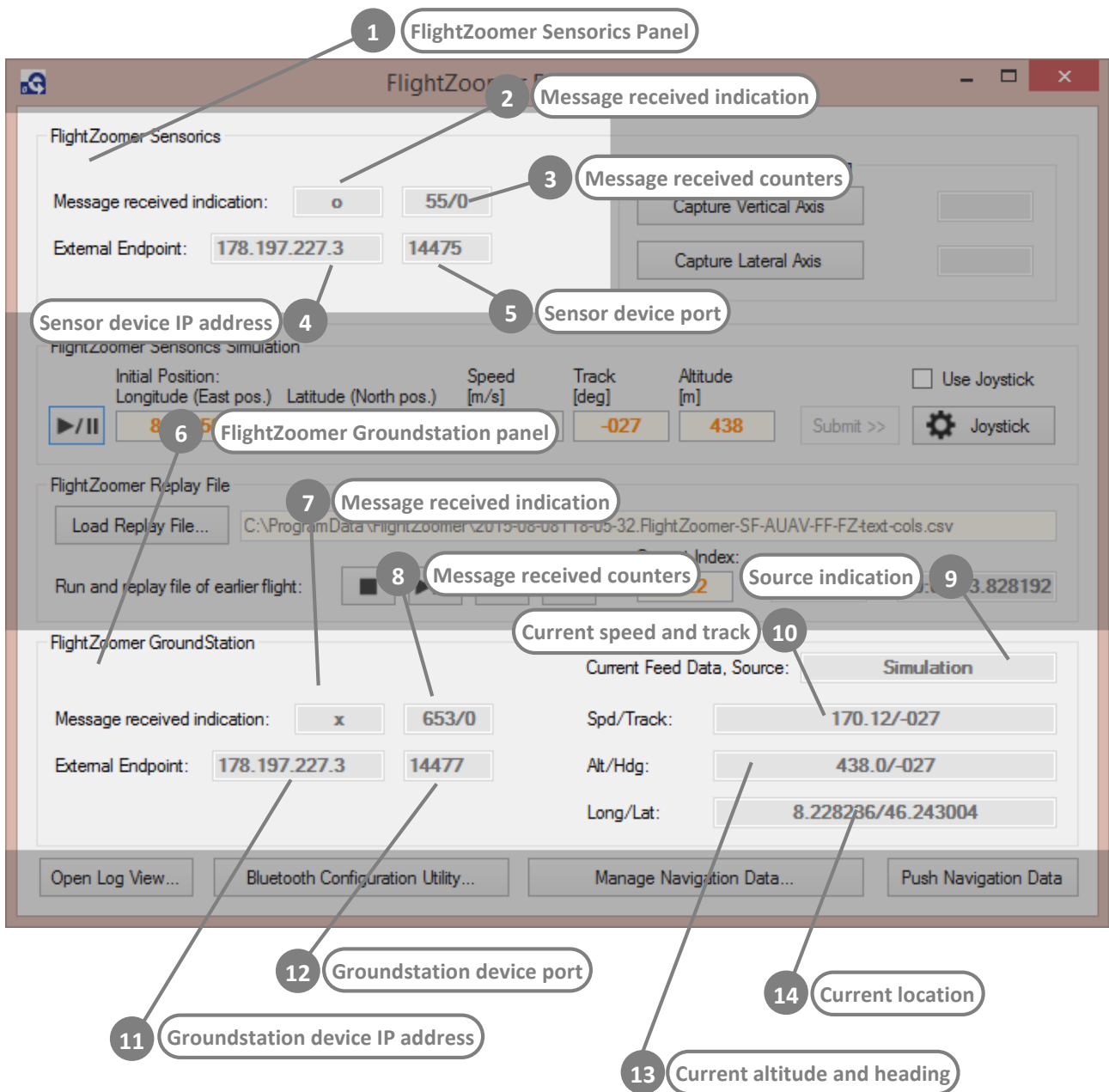
Other features are:

- Operational status indication.
- Automatically store sensor data into the flight log file as soon as the Flight Lock mode is activated.
- Flight simulation based on specified parameters or alternatively on joystick input.
- Replay earlier flight log files.
- Manage navigation data.
- Program HC-06 transceivers with the Bluetooth configuration utility.

3.1 Main screen – overview

3.2 Main screen – operational status

	Element	Purpose
1	FlightZoomer Sensorics Panel	Section that covers the connection to the sensor device.
2	Message received indication	Indication which toggles between "x" and "o" with each received message.
3	Message received counters	Sensor device message counter. Behind the slash sign the current number of non-sensor-data messages is shown.
4	Sensor device IP address	IP address from which the sensor device is sending messages.
5	Sensor device port	IP port from which the sensor device is sending messages.
6	FlightZoomer Groundstation panel	Section that covers the connection to the groundstation device.
7	Message received indication	Indication which toggles between "x" and "o" with each received message from a groundstation.

8	Message received counters	Groundstation message counter. Behind the slash sign the current number of non-sensor-data messages is shown.
9	Source indication	Indication that shows from where the current sensor data feed towards the groundstation is coming from. The following sources exist: - From Sensorics - Simulation - Replay File
10	Current speed and track	Indication of the speed and track (course over ground) as currently sent to the groundstation. Units are m/s and degree.
11	Groundstation device IP address	IP address from the groundstation device.
12	Groundstation device port	IP port from the groundstation device.
13	Current altitude and heading	Indication of the altitude and heading as currently sent to the groundstation. Units are m and degree.
14	Current location	Indication of the longitude and latitude as currently sent to the groundstation. Units are degrees.

3.3 Main screen – utilities
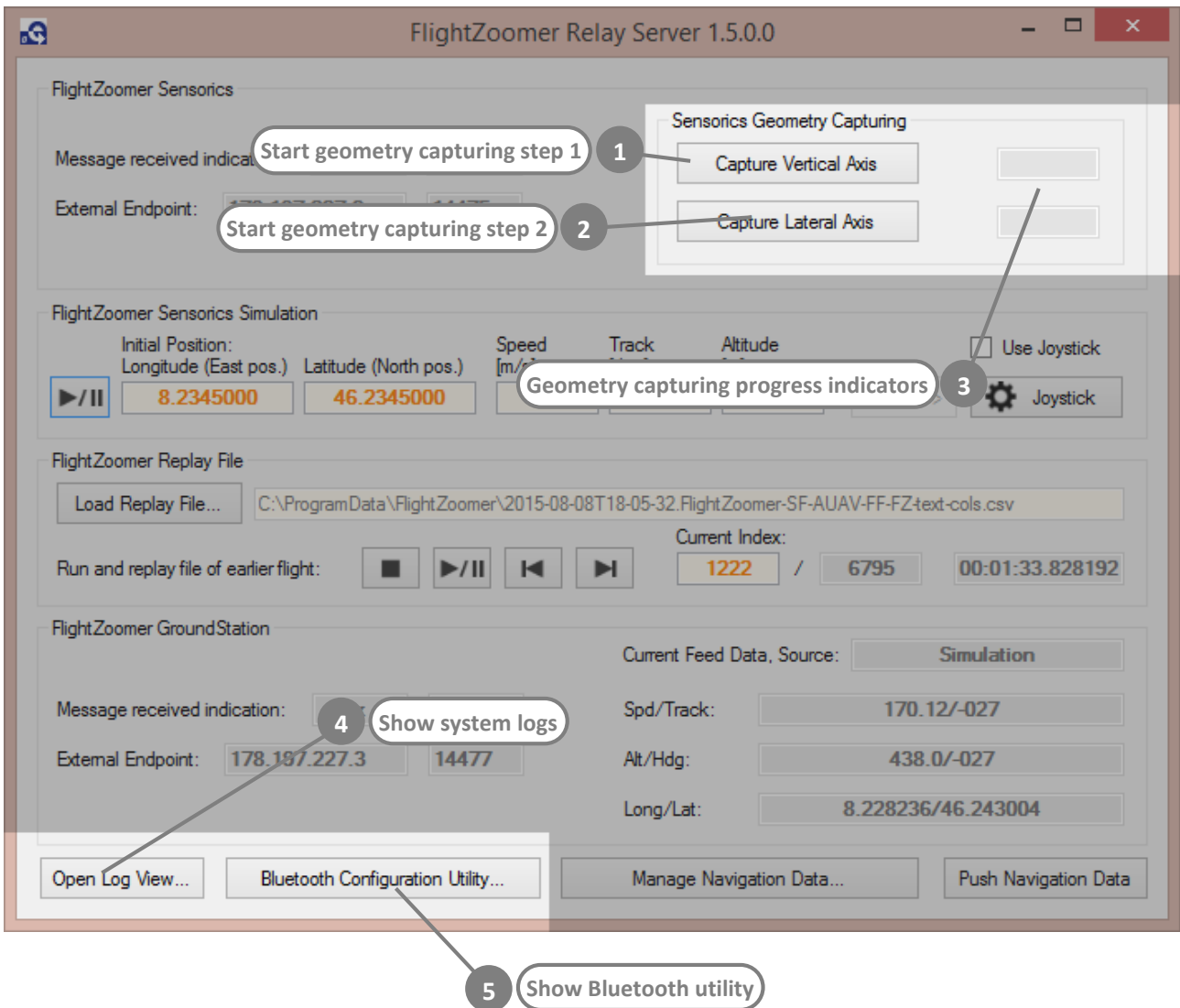
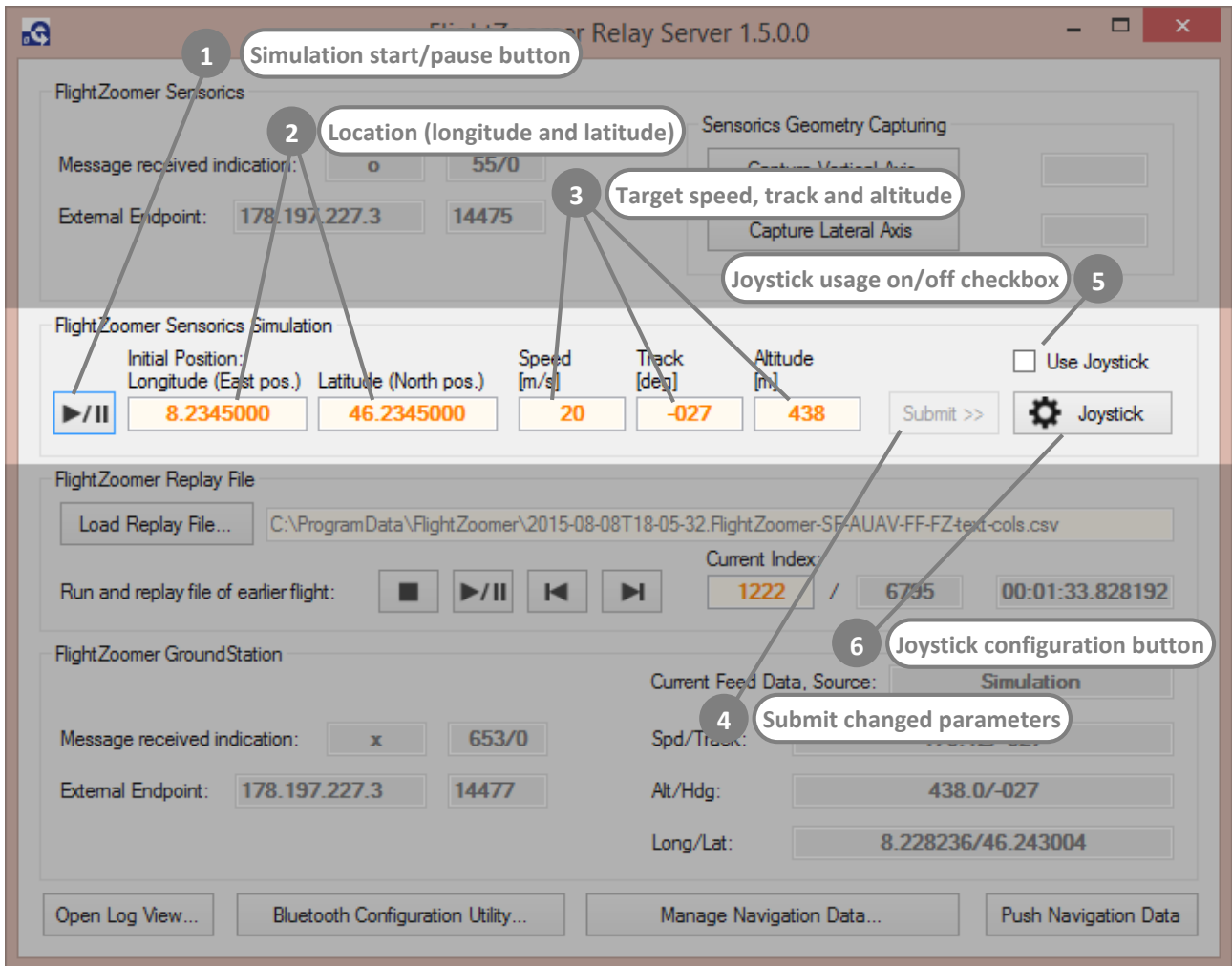|	Element	Purpose
1	Start geometry capturing step 1	Alternatively to the menu option in the FlightZoomer Sensorics app, the geometry capturing can also be launched from the relay server application. This buttons initiates the first step (during which the aircraft needs to be kept horizontal).
2	Start geometry capturing step 2	This buttons initiates the second step of the geometry capturing sequence (during which the aircraft needs to tilted forward).
3	Geometry capturing progress indicators	Progress indications in seconds for each of the two geometry capturing steps.
4	Show system logs	This button opens the log view pop up window.
5	Show Bluetooth utility	This buttons opens the Bluetooth configuration utility as described in Installation document.

3.4   Main screen – simulated sensor data feed

This feature allows injecting any desired flight parameter to simulate aircraft movements for training and demonstration purposes. Using this feature only the groundstation is needed (to "see" what's going on) while no sensor device is required (in fact the simulation is switched off as soon as real flight data from a sensor device is received).

The simulation is based on longitude/latitude for the (initial) position, the target speed, target track and the target altitude. Additionally small attitude variations are induced, which add realism.

The simulation provides following flight parameters:

	Parameter	Purpose
1	Location	Updated every second, derived from the simulated flight trajectory.
2	Speed	Updated by the simulation. Parameter of the current simulated flight trajectory.
3	Altitude, vertical speed	Updated by the simulation. Parameter of the current simulated flight trajectory.
4	Track/heading	Updated by the simulation. Parameter of the current simulated flight trajectory.
5	Pitch	Updated by the simulation. Derived from speed.
6	Bank	Updated by the simulation. Derived from track changes.
7	Horizontal accuracy	Constant value of 2m.
8	Vertical accuracy	Constant value of 5m.

|	Element	Purpose
1	Simulation start/pause button	This button starts or stops the flight simulation. Therefore clicking on this button switches off the replay file functionality if it was running). While running the simulation stops immediately and automatically if data from a sensor device is received.
2	Location (longitude and latitude)	The location can be defined while the simulation is paused. Once the start button was hit, the textboxes become disabled because the updated locations will steadily be generated by the simulation feature.
3	Target speed, track and altitude	These parameters define the flight trajectory, which the simulation uses. Depending on these parameters each second a new location is calculated. Derivatives as speed acceleration/deceleration (Δspeed), yaw rate (Δtrack) and vertical speed (Δaltitude) are calculated adequately to capture changed target values. If any of the target values is updated while the simulation is running, the Submit>>-button becomes enabled. The changed target value will only become effective once the Submit>>-button is hit.
4	Submit changed parameters	This button allows to activate changed target values for speed, track or altitude. More than one changed target value can be activated by one click on the button.

| 5	Joystick usage on/off switch	Alternatively the joystick can be used to simulate the flight trajectory. This checkbox activates reading the primary four joystick axes to determine the following four trajectory properties: speed-forwards, speed-sidewards, Δtrack and Δaltitude. Prior joystick usage the joystick needs to be configured.
6	Joystick configuration button	With this button the joystick configuration popup window can be opened.

Joystick configuration popup window

With this popup window the joystick can be configured:
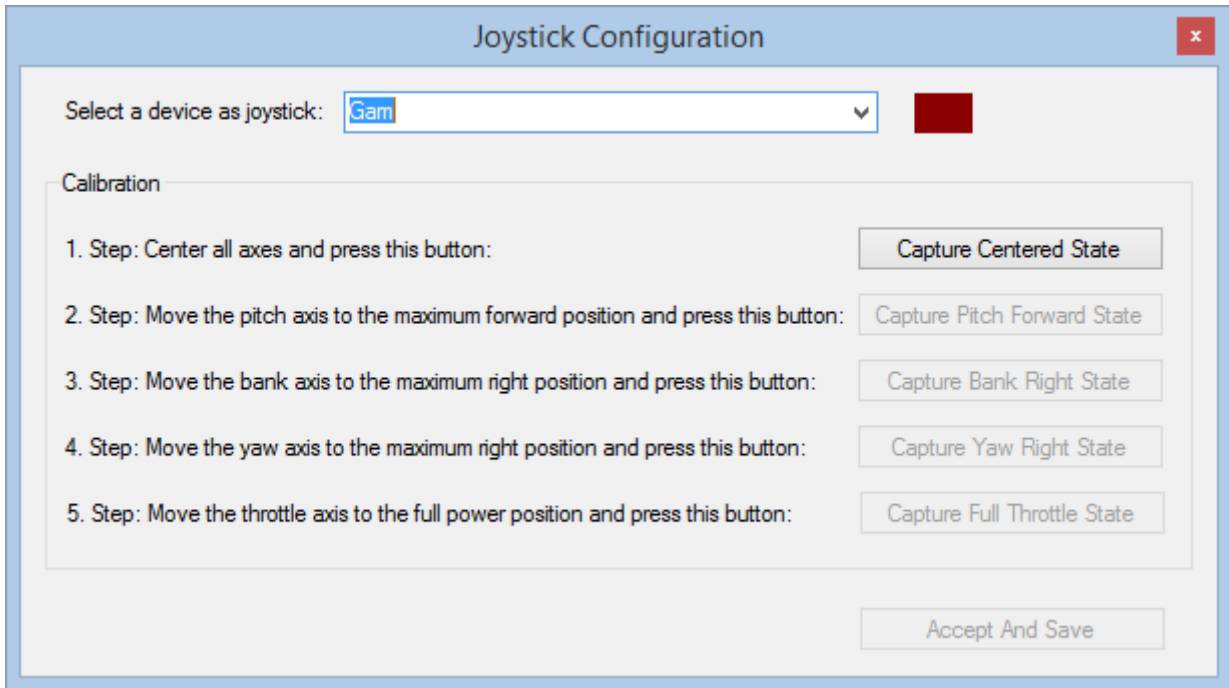
The following procedure is needed to configure all the axes:

1. First select the joystick in the drop down box.
2. Follow the instruction of Step 1 until Step 5 and press the respective button to define and measure each axis.
3. After the pitch, bank and yaw axis have been defined (Step 2 to Step 4) the minimum configuration has been reached and the red indicator at the top becomes green:
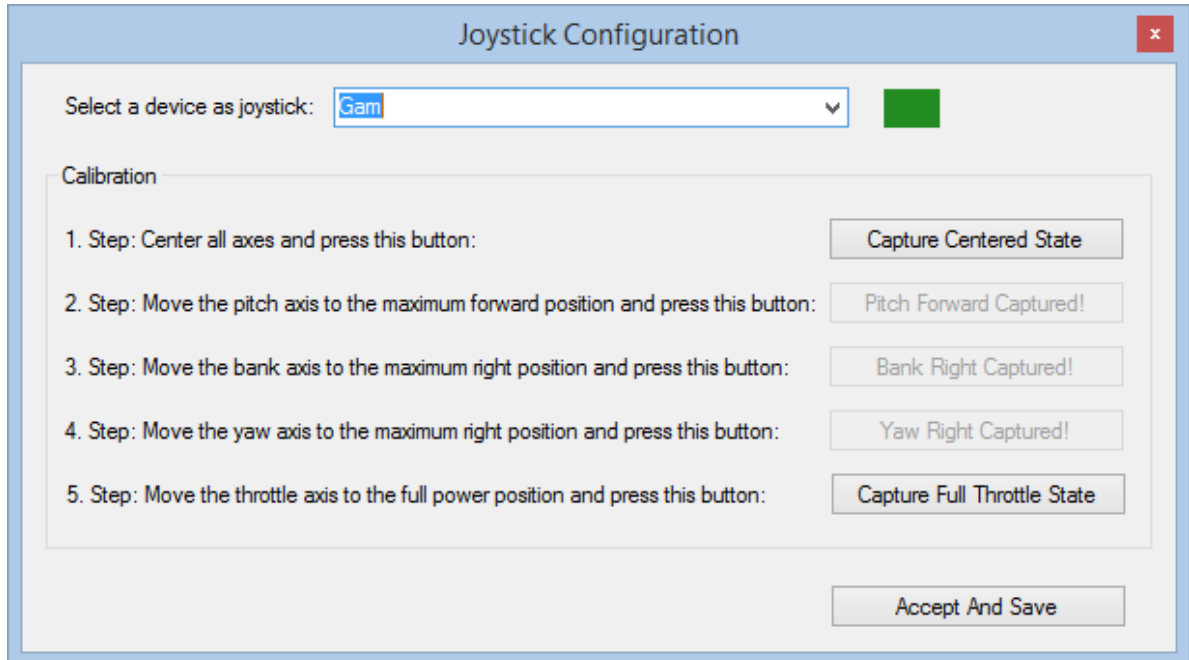
4. The throttle (Step 5) can be defined optionally. This allows to use joysticks with only three axes. The limitation is lack of altitude control.
5. At any time the whole procedure can be reinitiated by capturing the centered state again.
6. In the end click on the "Accept And Save"-button.

3.5 Main screen – replay flight from log file
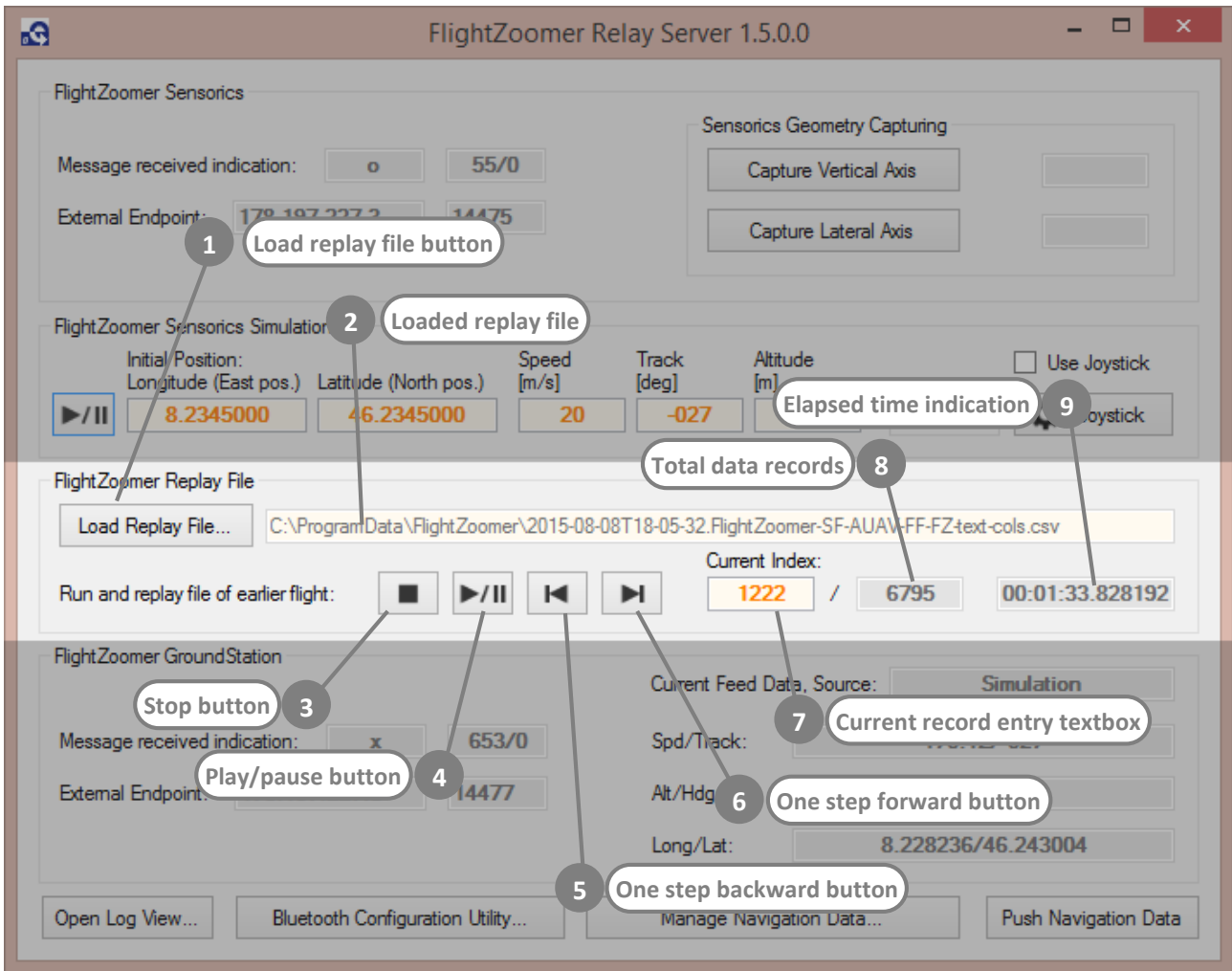
	Element	Purpose
1	Load replay file button	This button opens a file selection popup window which allows selecting a flight log file from an earlier flight.
2	Loaded replay file	This read-only textbox shows the path and name of a loaded flight log file.
3	Stop button	This button stops the playback and resets the current index.
4	Play/pause button	Start playback of the loaded flight log file. Repeated clicks toggle between playing back and paused.
5	One step backward button	Allows single step backward movements while the playback is stopped or paused. The current record and the elapsed time indication will be updated accordingly.
6	One step forward button	Allows single step forward movements while the playback is stopped or paused. The current record and the elapsed time indication will be updated accordingly.
7	Current record entry textbox	Allows to specify the exact record number while the playback is stopped or paused. The elapsed time indication will be updated accordingly. Playback will continue exactly at the specified record.
8	Total data records	This read-only textbox shows the total number of data records in the loaded file.

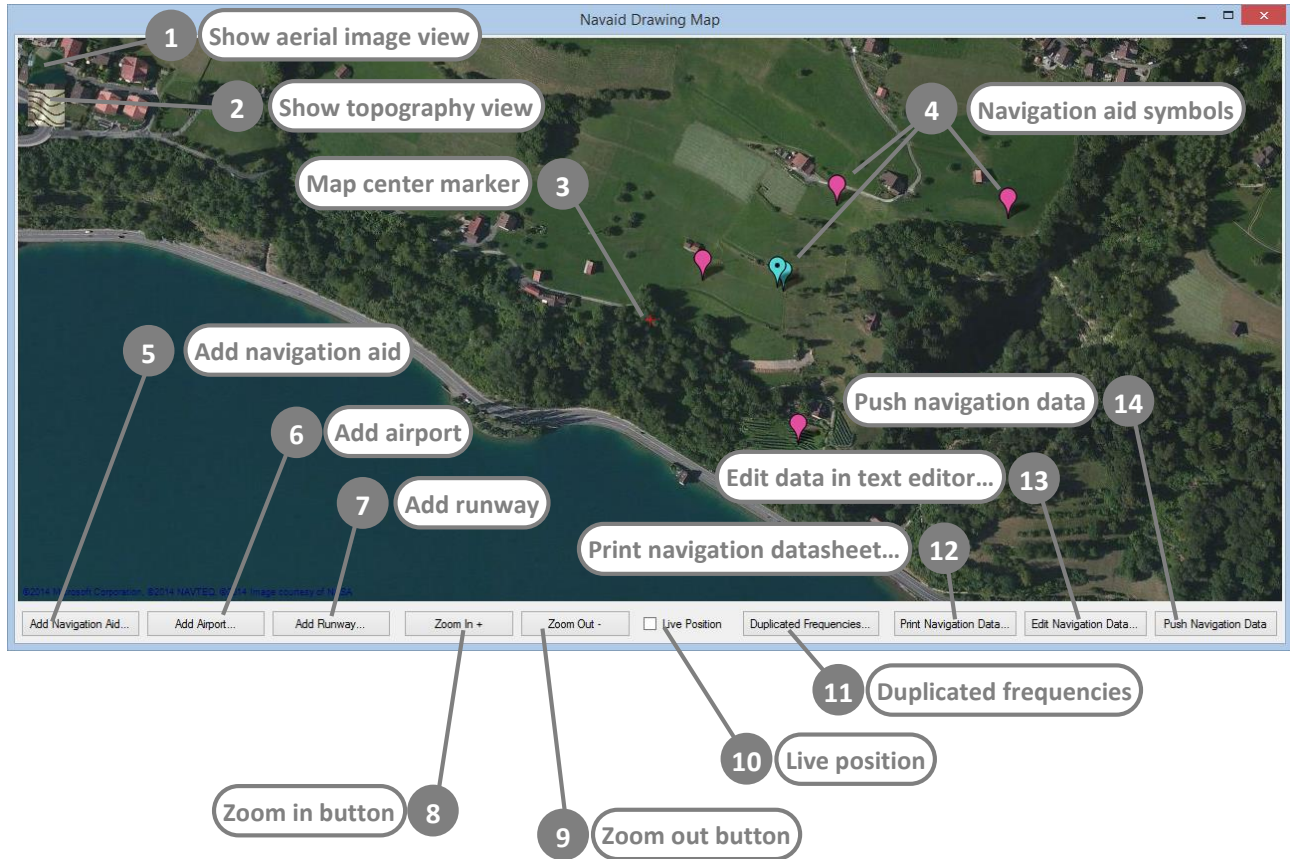| 9	Elapsed time indication	The elapsed time indication shows the duration since the beginning of the replayed file.

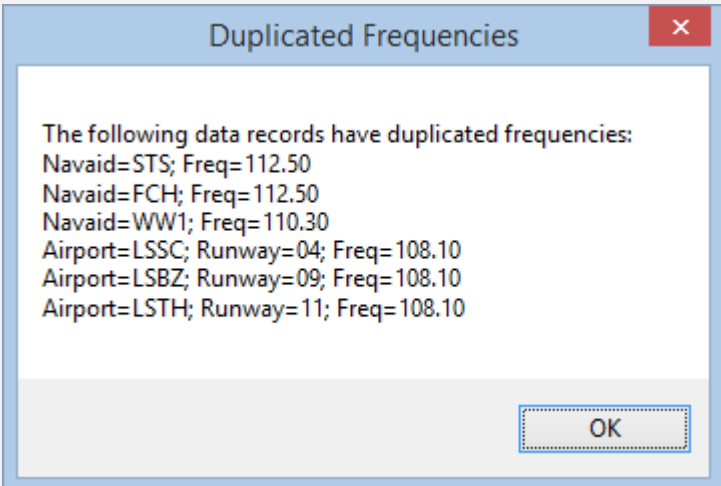## 3.6   Main screen – navigation data
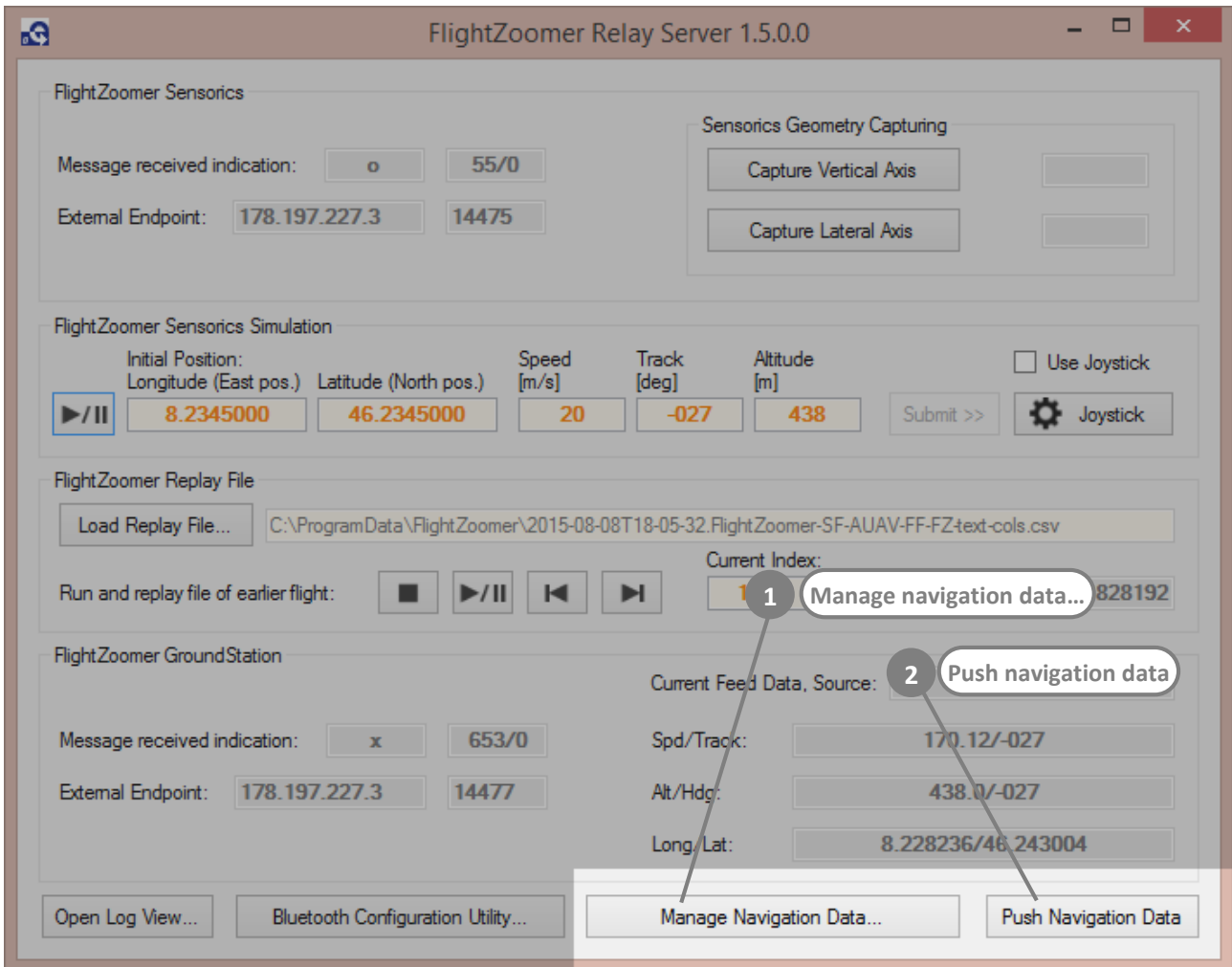
	Element	Purpose
1	Manage navigation data	This button opens a popup window which allows to manage the navigation data (create, update or delete navigation aids, airports or runways).
2	Push navigation data	Forces updated navigation data to be sent to the groundstations.

3.7   Navigation aid drawing map – overview

With this popup window the navigation data is managed. Navigation aids, airports and runways can be added, updated or deleted. Details about the navigation aids data model can be found in the functional document.
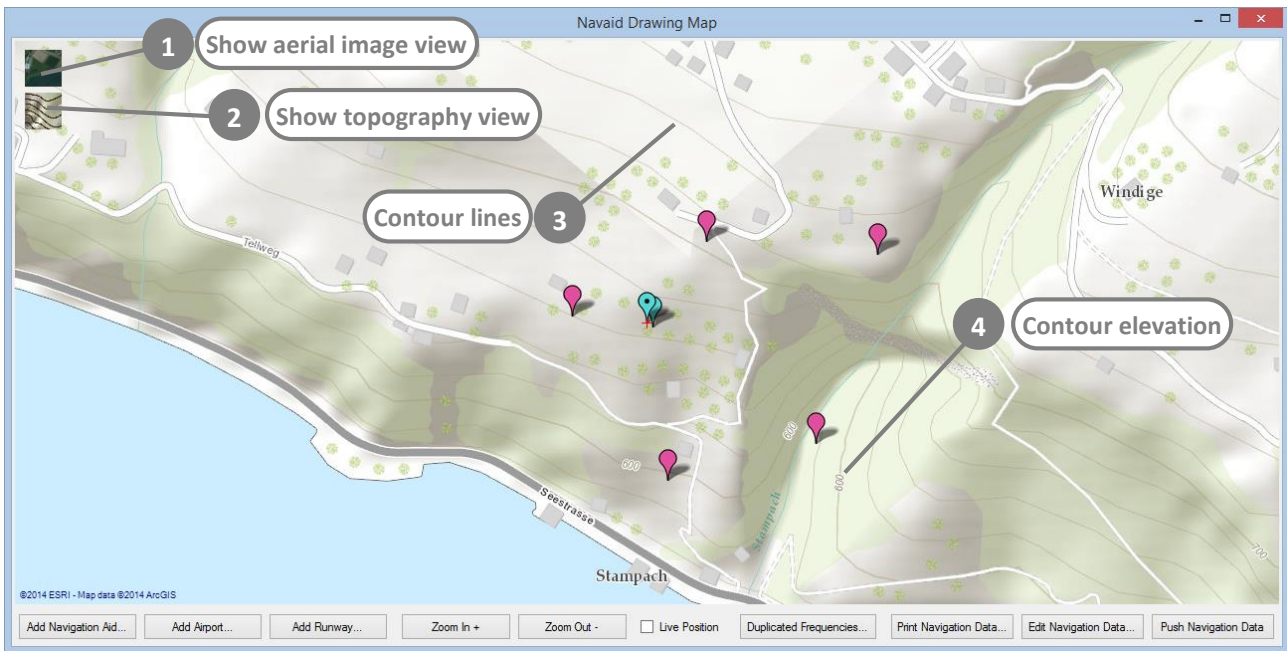

	Element	Purpose
1	Show aerial image view	This button shows the aerial image view (default).
2	Show topography view	This button activates the topography view (see below for a screenshot). The topography view shows the contour lines which allow to determine the elevation of navigation aids.
3	Map center marker	The map center marker needs to be placed correctly (by moving the map) before one of the add-… buttons is clicked.
4	Navigation aid symbols	Added navigation elements (navigation aids, airports or runways) are shown on the map with one of these symbols: Navigation aid symbol Airport symbol Runway symbol By clicking on any of these symbols, the property view opens on the right side of the screen.

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5	Add navigation aid	This button adds a navigation aid at the coordinates where map center marker is positioned.
6	Add airport	This button adds an airport at the coordinates where map center marker is positioned.
7	Add runway	This button adds a runway at the coordinates where map center marker is positioned.
8	Zoom in button	This button scales up the shown area on the screen.
9	Zoom out button	This button scales down the shown area on the screen.
10	Live position	By clicking on this checkbox, the map center starts following any reported location from a connected sensor device.
11	Duplicated frequencies	This buttons opens a small popup window which shows any duplicated frequencies. This information allows to detect and correct frequencies, which have been assigned two or more times:
12	Print navigation datasheet…	This button allows printing a cheat sheet which lists all navigation aids, airport and runways.
13	Edit data in text editor…	This button opens the text files of the navigation database in text editors.
14	Push navigation data	Forces updated navigation data to be sent to the attached groundstations again (the same functionality as on the main screen).

3.8 Navigation aid drawing map – topography view

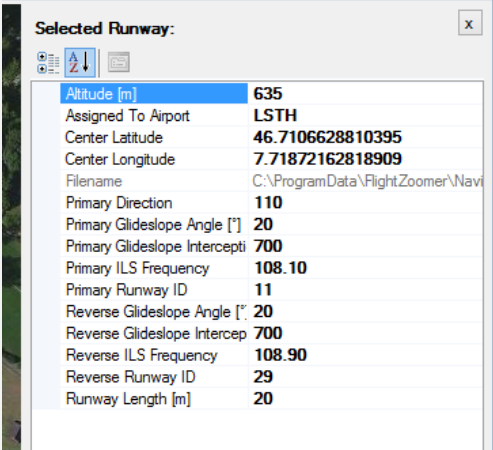Alternatively to the aerial image view, the topography view can be activated:

	Element	Purpose
1	Show aerial image view	This button shows the aerial image view (default).
2	Show topography view	This button activates the topography view (see below for a screenshot). The topography view shows the contour lines which allow to determine the elevation of navigation aids.
3	Contour lines	This view shows lines of equal elevation.
4	Contour elevation	The elevations of the major contours are printed on the map as well (in meter).

3.9   Navigation aid drawing map – property view

By clicking on an existing navigation element or by add a new navigation element, the properties are shown and the center mark is placed on the selected navigation element:
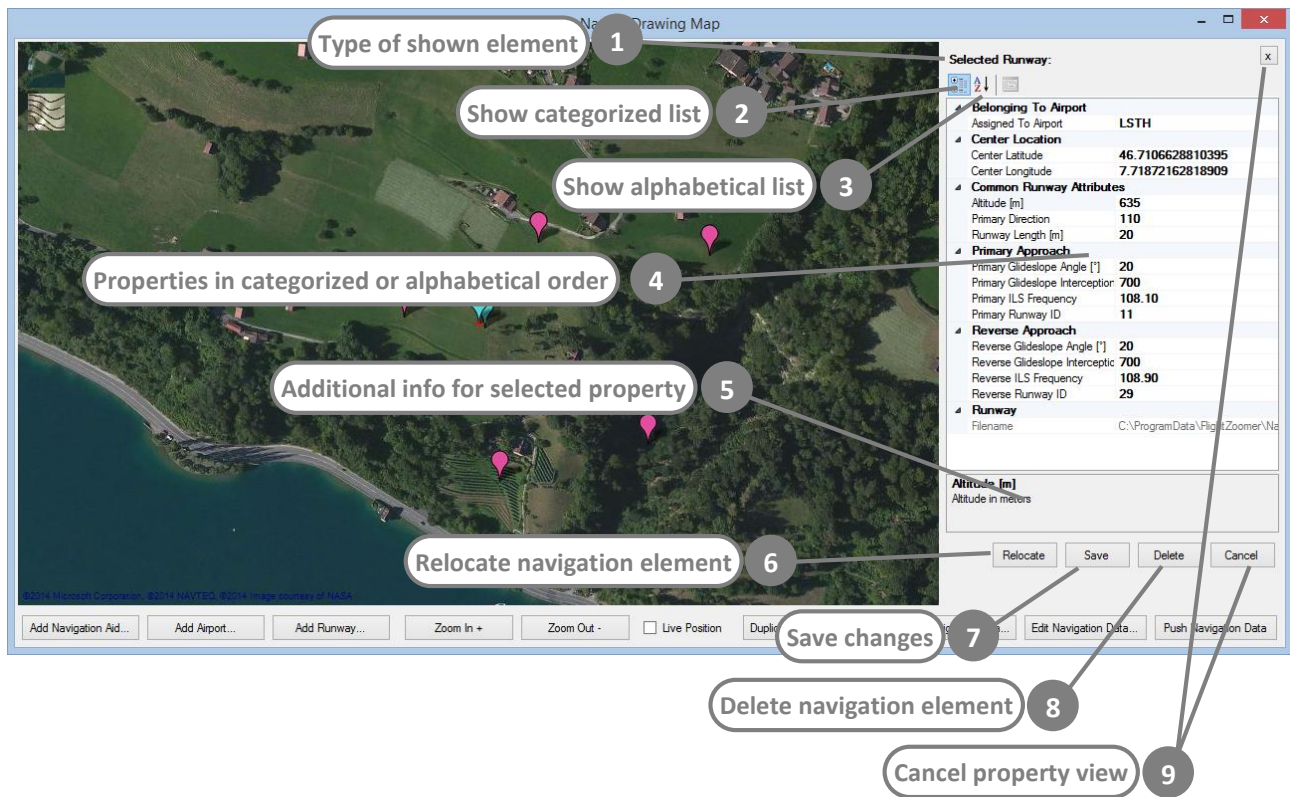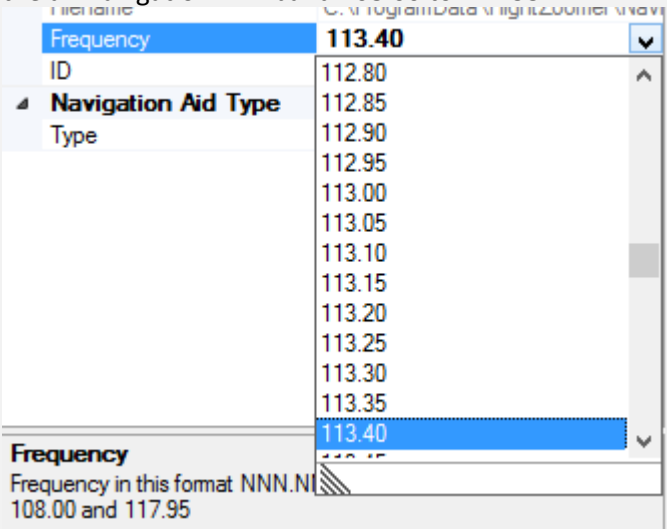

	Element	Purpose
1	Type of shown element	This text label shows the type of the selected navigation element.
2	Show categorized list	List the properties in categorized order.
3	Show alphabetical list	List the properties in alphabetical order as follows:
4	Properties in categorized or alphabetical order	The property list itself. Any property of the selected navigation element is shown. The properties can be defined or changed by clicking on the property and entering the correct value.

		For some properties the possible list of values is presented in a drop down box. Some properties are read-only.
5	Additional info for selected property	If a particular property is selected, additional information is shown on this panel at the bottom of the property list.
6	Relocate navigation element	This button allows to store a different location for a navigation element. Proceed as follows: Move the map until the center mark shows is at the new location for the selected navigation element. Click on the Relocate button. Click on the Save button to store the changes.
7	Save changes	With this button changed properties can be saved.
8	Delete navigation element	This buttons deletes the selected navigation element from the navigation database. Before the deletion is executed a confirmation popup window appears.
9	Cancel property view	This button closes the property view without storing any changes.

Special properties

The following list of properties offers not just a plain textbox but a list of the possible values presented in a drop down box:

	Property	Purpose
1	Frequency (navigation element: navigation aid and airport)	The dropdown list presents all so far unused frequencies in the air navigation VHF band 108.00 to 117.95:
2	Primary ILS Frequency and Reverse ILS Frequency (navigation element: runway)	The dropdown list presents all so far unused frequencies in the ILS band 108.00 to 111.95:

3	Assigned to airport (navigation element: runway)	The dropdown list allows to select one of the available airports to assign the runway:

4 Appendix

4.1 Glossary

	Abbreviation/term	Description	Real aviation term
	FMS	Flight Management System	X
	ILS	Instrument Landing System	X
	IM	Inner Marker	X
	LNAV	Lateral Navigation Auto flight mode where the loaded flightplan is being followed.	X
	MM	Middle Marker	X
	ND	Navigation Display	X
	OM	Outer Marker	X
	PFD	Primary Flight Display	X
	VOR	VHF omnidirectional range	X