# iX Plan 2024

# **Operation Guide**





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# 1. Introduction

## 1.1. Scope

This manual describes how to use the iX Plan 2024 software as follows:

- Section 2 Product Overview
- Section 3 Getting Started
- Section 4 Getting to know the interface
- Section 5 Creating and configuring projects
- Section 6 Configuring the sensors
- Section 7 Defining flight linesSection 7 Defining flight lines
- Section 8 Performing Quality ControlSection 7 Defining flight lines
- Section 9 Performing Queries
- Section 10 Configuring Settings
- Section 11 Import options
- Section 12 Exporting Projects

## **1.2. Applicable documents**

Item	Manual	
Phase One iX Flight Pro	iX Flight Pro Operation Guide	



# 2. Product Overview

Phase One iX Plan 2024 is an application for generating aerial photogrammetry and mapping flight plans. It allows you to easily generate flight plans for importing into Phase One iX Flight Pro. It enables fast import of digital terrain models (DTM), base maps, project shapes and ground control points, and includes a database of Phase One sensors.

You can easily add flight lines, edit existing ones, and enable automatic planning.

iX Plan 2024 shows existing ground control points and supports the identification and positioning of new ones.

## 2.1. Viewing the Changelog

To view new features and fixes for iX Plan 2024 versions, click the following link:

https://app.topoflight.com/changelog/missionplanner/vendor/phaseone



# 3. Getting Started

#### 3.1. Requirements

- RAM: 16 GB recommended, 4 GB minimum
- Windows 10 64-bit or higher
- Valid iX Plan 2024 license (hardware or software license)

## 3.2. Installation

iX Plan 2024 may be installed on any computer.

The iX Plan 2024 license dongle must be inserted in a USB port of the PC running iX Plan 2024 or the software license must be installed on a local machine or on a company license server.

#### Note

The latest version of iX Plan 2024 is available <u>here</u>.

For licensing information, contact Phase One Technical Support .

#### To install iX Plan 2024:

- 1. Run the setup file provided by Phase One and follow the instructions in the setup wizard.
- 2. Insert the iX Plan 2024 license USB dongle into a USB port or activate your software license.
- 3. Run iX Plan 2024.
- 4. When you first run iX Plan 2024, you are prompted to select a path for storing the elevation data. You can change the location of this directory later in the Section 10.1.3 Elevation data.

#### Note

If your machine does not recognize the license, contact Phase One Technical Support .



# 4. Getting to know the interface

This section describes the iX Plan 2024 interface as follows:

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## 4.1. General

The iX Plan 2024 user interface is divided into the following main elements:



ltem	Element	Description
1	Navigation bar	Contains links to iX Plan 2024's main pages.
2	Secondary sidebar	Contains links to the page's related content, settings, or additional features.
3	Workspace	The main area where you perform most actions related to creating and modifying your flight plan.
4	Layers panel	Displays the map layers and allows you to manage them.
5	Status bar	Displays coordinates and terrain altitude for the current mouse position.



iX Plan 2024 Operation Guide 4. Getting to know the interface

## 4.2. Navigation bar

The Navigation bar contains the following links to iX Plan 2024's main pages:

## • 🔀 Start

Includes commands for creating new projects or opening existing ones. The last opened projects are available via tiles with a thumbnail image.

## • 闭 Project

Includes settings that you can configure for the currently open project. Here you can also draw the area of interest (AOI) and ground control points (GCP).

## \* 🚷 Sensor

Includes options for selecting and configuring the camera or system that is used in your project.

## • 🅢 Flight lines

Contains parameters for configuring basic metrics, calculating altitude and creating/managing flight lines.

## • 🕅 QC (Quality Control)

Contains tools to assist you in evaluating if your flight plan meets the project requirements.

# • 📝 Queries

Contains tools for extracting information from your flight plan according to different parameters.

## • 🕞 Export

Contains options for exporting your flight plan to other formats.

## • 🔯 Settings

Contains options for configuring iX Plan 2024 options such as display settings, flight lines and elevation data.

## • (i) About

Displays information on the current iX Plan 2024 version (including new features and bug fixes).

Online documentation

Latest release - direct download of the latest software installer (.exe)

Online reference of the software program



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4. Getting to know the interface

## 4.3. Secondary sidebar

The secondary sidebar appears for the following Navigation bar items:

- 🔀 <u>Project</u>
- 😥 <u>Sensor</u>
- 🌈 <u>Flight lines</u>
- 🕅 <u>QC</u>
- Queries
- Export

## 4.4. Workspace

The workspace is the main area where you perform most actions related to creating and modifying your flight plan. You can interact with the workspace through the Secondary sidebar and Layers panel.

It offers quick access to different viewing options, such as the 3D view mode and to Map scale settings for your project.

## 4.5. Layers panel

Displays the map layers and allows you to toggle specific layers on or off. Right-click any layer to view additional functions you can perform on the layer, such as Customizing layers.

#### Note

To change the stacking order of the layers between front and back, drag each layer up or down as required.

## 4.6. Status bar

The Status bar displays the following information:

- EPSG Code of the map coordinate system
- mouse position X, Y and Z coordinates/terrain altitude [ft]
- coordinate reference system (CRS)
- latitude and longitude of the current mouse position

```
32632 X : 396870.7695 | Y : 5182358.8486 | Z: 677.0 WGS84 Lat : 46° 47' 12.48" N | Lon : 7° 38' 55.86" E
```

• In addition, a layer can be selected from the available pixel layers. In the last field, the cell value on the mouse position is displayed.

TerrainImage 🗸 🗸 Cell value: 0, 42, 205 (R,G,I
--



# 4.7. Keyboard shortcuts

Shortcut	Action
Ctrl+S	Save the project.
Ctrl+Shift+S	Save the project with a new name.
Ctrl+L	Open the log.
Ctrl+D	Download the SRTM for current location.
Ctrl+P	Repaint map canvas.
Ctrl+U	Clear (unselect) everything.
Ctrl+mouse wheel	Use smoother zoom.
Esc	Terminate the current action/function.
Backspace	The last drawn marking (such as flight line or AOI) is deleted.
F1	Open the online documentation.
F2	Activate the visibility of all layers.
F3	Hide all vector layers.
F4	Hide all raster layers.
F5	Keep the following layers visible while hiding all other vector layers:
	• flight lines
	• image positions
	• project area
F6	Keep the following layers visible while hiding all other vector layers:
	• footprints
	overlaps
F7	Keep the following layers visible while hiding all other vector layers:
	• terrain
:	



# 5. Creating and configuring projects

This section describes how to create and configure projects in iX Plan 2024 as follows:

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## 5.1. General

Optimal flight plans are based on three datasets:

- a base map covering the area to be photographed (2D)
- a digital terrain model (DTM) for elevation data
- an area of interest

In iX Plan 2024, all three datasets can easily be selected, imported and/or customized when creating a new project.

#### Note

In the absence of a DTM, the software defaults to a flat terrain assumption with an elevation of Z=0.

## 5.2. Creating a new project

#### To create a project:

- 1. In the Navigation bar, click 🔀 Start.
- 2. Click HNew project.



- 3. In **Project path**, click .... and navigate to the folder where you want to save the project files. Create a new folder if required.
- 4. In File name type a name for your project.
- 5. Click Save.
- 6. Select the project location using any of the following methods:
  - online in Project location type the name (city/country) or adjust the map zoom to encompass your specific area of interest
  - offline in Load AOI, click .... and navigate to the required file.



- 7. Set the required projection using either of the following options:
  - Click Calculate best UTM zone for the default UTM WGS84 projected system.

#### Note

This is the recommended option as the most suitable UTM zone for the designated area is automatically selected.

- In Current projection click .... and select one of the following:
  - **Projected system** (for experienced users only) you can select regional or national systems that you are familiar with .
  - Geographic systems (not recommended) you can select geographic systems in degrees.
  - Turn off do not use a coordinate system

#### Note

Select the projection thoughtfully - for more information see Modifying the coordinate reference system.

- 6. Configure Additional settings as required:
  - Add default base map to map default: selected
  - Create image from WMS (recommended) the base map is available offline and the viewer reacts faster as it does not stream the data for each zoom level.
  - Add SRTM elevation data default: selected.

#### Note

To configure the SRTM elevation data, see Elevation data.



7. Click **OK**. The new project opens under **Project** in the Navigation bar.

#### Note

For easy access, the six most recently used projects are listed in the Start window.

## 5.3. Modifying the coordinate reference system

A flight plan is created only when the following coordinate reference system requirements are met:

- a projected coordinate system is selected
- the axes are orthogonal
- the map unit is in meters [m]

The default base map provided when the project is created uses the commonly used Mercator web map projection.

#### To select a different coordinate reference systems for the map (Map CRS) and the flight plan (Flight CRS):

- 1. In the Navigation bar, click 🗡 Project.
- 2. In the secondary sidebar, under COORDINATE SYSTEMS, select the required Map CRS and/or Flight CRS.

The Workspace viewer automatically converts any imported maps to match the selected Map CRS. After making changes, new flight line layers are also saved in the selected Map CRS.

#### Note

Base maps and associated data must be available on a computer in the local network.

#### Caution

Refrain from making excessive adjustments to these settings. If required, modify the Map CRS before creating flight lines.

## 5.4. Adding base maps and reference data

The Phase One base map is the default map included when you create a project.

#### To select other base maps and add them to the project:

1. In the Project secondary sidebar, under **BASEMAP**, click the **Base map** list and select the required base map.

#### Note

If you select **Open WMS/WMTS Layer**, a window appears prompting you to specify the server URL and layer name.



Base maps and related reference data can have the following file formats:

- AutoCAD DXF files (\*.dxf)
- GEOTIFF
- Google Earth (\*.kml)
- Microstation DGN
- MrSID (\*.sid). Up to the versions 3.7, MrSID files cannot exceed a certain size (ca. 150 MB)
- Shapefiles (\*.shp)
- TIFF with TFW header

Any maps you add are visible in the Layers panel.

#### Note

To modify a layer (see Customizing layers), in the layers panel double-click or right-click the layer name.

## 5.5. Drawing a grid

#### To modify grid settings:

- 1. In the Project secondary sidebar, under **BASEMAP**, click the **Draw grid** box.
- 2. Configure the Grid settings (see Grid settings).

## 5.6. Defining the AOI (Area of Interest)

Under AREA(S) OF INTEREST, use the icons to perform the following tasks:

#### Drawing an AOI:

- 1. Click  $-\frac{1}{1}$  to draw the AOI.
- 2. In the Workspace, left-click the map to designate each AOI vertex.
- 3. Right-click or press Esc.





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5. Creating and configuring projects

#### Modifying an AOI:

- 1. Click 🖍 to edit the area of interest.
  - a. Move vertices left click an existing perimeter point. The point changes to red. Drag-and-drop the point to the required location.
  - b. Add vertices a new vertex is added between two points by left-clicking the point with the lower index number (the point changes to red) and then clicking the required position of the new vertex on the map.
- 2. Right-click or press Esc.

#### Deleting an AOI:

- 1. Click 🔟 .
- 2. Left-click the AOI to delete.

#### Importing an existing AOI file:

• Click 🕁 and navigate to the required file.

#### OR

Drag and drop an AOI file directly into the workspace.

#### Note

Google Earth KML files, as well as a variety of other file formats, are fully supported.

#### Saving an AOI as KML file:

- 1. In the Navigation bar, click  $\square$
- 2. In the Export Project window, in the left sidebar, click KML.
- 3. Select the **ProjectArea** checkbox.
- 4. Click **Set path** configure the folder and filename for the KML file and click **Save**.
- 5. Click Export.

#### Saving an AOI as GEOJSON file:

#### Note

All AOIs created in iX Plan 2024 are automatically saved as GEOJSON files (with the extension geojson.ttkstyle) in the project folder.



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5. Creating and configuring projects

#### To manually save a GEOJSON file:

- 1. Double-click the **ProjectArea** layer (see Customizing layers).
- 2. Select a path and name for the AOI layer.
- 3. Click 📘.

+ - x • A	Parameters	
General Sections	Path	
<ul> <li>Section 1</li> </ul>	G:\Shared drives\Customers\PHSO\20 Wor	kspace\Manned\iX Suite\iX Pl
Renderer	Name	
Marker	ProjectArea	
Area	Caption	
Label	AOI	
3D	Coordinate System	
	WGS 84 UTM zone 34N (epsg: 32634)	Select
	Drinting	
	Painting	
	Basemap	Transparency
	Cached Paint	100 ~
	Ignore shape parameters	
	Multipass rendering (slower!)	
	Scope (must be logical)	
		~
	Prefer styling from config file	
> B	Aggregation	

## 5.7. Updating the elevation model (DTMs)

When you create a project, SRTM data for the initially selected map section is automatically downloaded (unless **Add SRTM elevation data** was not selected when creating the project).

#### Note

To validate that elevation data exists, on the Status bar check that Z coordinate displays a numerical value.

#### Importing an SRTM for a larger area of coverage:

- 1. In the Workspace, adjust the map view as required.
- 2. In the Project secondary sidebar, under **ELEVATION MODEL**, click **Download SRTM**. Any previous SRTM layers are replaced with the updated map data for the current workspace view.

#### Note

To import other DTMs such as USGS DEMs or TIFF DEM files, click the **Download SRTM** list.

#### 5.8. Importing external data

iX Plan 2024 supports numerous common geodata formats. You can easily incorporate external data, such as flight lines or image centers, with a simple drag-and-drop into the Workspace. For more information, see Import options.



#### Note

Before importing external data, a sensor must be configured (see Configuring the sensors

For iX Plan 2024 to consider imported data (such as flight lines or image positions) as if it had been planned in iX Plan 2024, the external data must be imported as a CSV file. Another option is to manually create the GEOJSON file.

## 5.9. Defining Ground Control Points (GCPs)

You can use the GCP tools to place approximate GCP positions on the map for determination by a ground surveyor. The map can be printed and given to field surveyors. The surveyors know the approximate location where the photogrammetrists have specified a GCP. A surveyor can go to the location to signalize the points and measure its coordinates.

Under GROUND CONTROL POINTS, use the icons to perform the following tasks:

#### Adding a GCP:

- 1. In ID, enter the value of the next GCP you are adding.
- 2. In Type, select the type of GCP: Control point or Check point.
- 3. Click ---.
- 4. In the Workspace, click where you want the GCP to appear.
- 5. After defining the initial GCP, a new map layer appears in the layers panel.



#### Note

Refer to Customizing layers for details on configuring the display of GCPs.



iX Plan 2024 Operation Guide 5. Creating and configuring projects

#### Modifying a GCP:

1. Click 🚺 to edit a GCP.

2. Click an existing GCP and modify the ID value and Type as required.

#### Deleting a GCP:

1. Click 🔟 .

- 2. Click the GCP to delete.
- 3. Refresh the workspace by clearing the Ground Control Points checkbox, then selecting it again.

## 5.10. Saving a project

Projects are automatically saved when a sensor is added to the project. Any other time, you can manually click the  $\square$  button on the top left in the workspace.

Additionally, you can save the project under a different name by clicking the down arrow next to the button. The original project remains unchanged.

## 5.11. Deleting a project

#### To delete a project from the Start page:

- 1. In the Navigation bar, click 🖉 Start.
- 2. On the pane of the project you want to delete, click  $\overline{\amalg}$  .

#### Note

To delete the files from your PC, use Windows Explorer to navigate to the project folder and delete it.



# 6. Configuring the sensors

This section describes how to configure the sensors as follows:

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6.5.2.2 Adding a sensor to a model	
6.6. Deleting sensors from database	

## 6.1. General

#### iX Plan 2024 uses sensor parameters to calculate flight lines and trigger points.

After you create a project, you need to select a sensor frame or sensor system. You can also select multiple sensors.

#### To select sensors:

1. In the Navigation bar, click 🕸.

#### Note

At the bottom of the secondary sidebar, click **Update database** to fetch all available sensors from Phase One's online resources.

2. In the workspace, click **FRAME** or **SYSTEM** according to the sensor(s) you will be using for the project.



## 6.2. Configuring Frame Sensors

- 1. Click FRAME.
- 2. In the Select brand box, click PhaseOne.
- 3. In the **Select model** box, click the required sensor model.
- 4. In the **Select configuration** box, click the required configuration, which corresponds to the focal length. On the right, the model and configuration parameters are automatically populated with the corresponding values.
- 5. Under GEOMETRICAL CONSTRAINTS, enter the required GSD (the GSD describes the spatial resolution or pixel size of an image on the ground). The HAGL is automatically calculated and the airplane height and sensor footprint are visualized on the right side of the workspace (see Section 6.4 - Visualization of sensor settings).
- If necessary, adjust the Sensor orientation, Roll, Pitch and Yaw parameter values. The depiction of the footprint changes accordingly.

FRAME	Lidar p	USHBROOM	STEPPER	SYSTEM
Select brand	MODEL			
PhaseOne	Name	XM-RS150F		<i>I</i> <sup>*</sup>
	Sensor pixel size	3.76	[um]	-
	Sensor width	14204	[px] 53.410	[mm] +
	Sensor height	10652	[px] 40.050	[mm]
	Offset principal point	0.000	[mm] 0.000	[mm]
	Max. frames per second	2.00		
<b>①</b> ①	CONFIGURATION			
	Name	XM-RS150F - 90 mm		ľ
	Focal length	90.00	[mm]	
Select model IXA 160	FOV along track	25.09	[deg]	<u>+</u> 1
IXA 180 IXM-100	FOV cross track	33.05	[deg]	
IXM-100 RSM IXM-100 SK				
XM-200 XM-50 RS XM-50 RSM	GEOMETRICAL CONSTRA	AINTS		
XM-50 SK XM-GS 100	HAGL	0.00	[ft] 0.00	[m]
XM-GS 120 XM-GS 120 RSM	GSD	0.00	[cm]	
XM-RS150F XU 1000	Sensor orientation	Landscape ~	]	
IXU 150 IXU 160	Roll	0.00	[deg]	
⊕ <sup>†</sup>	Pitch	-90.00	[deg]	
	Yaw	0.00	[deg]	
Select configuration           004451595 - 130 mm           004451595 - 130 mm           004451595 - 130 mm           004451595 - 30 mm           004451595 - 90 mm	٤	🕂 Add selec	ted sensor to pro	ject

#### Note

- The GSD is directly related to the HAGL and depends on the focal length of the selected camera.
- The HAGL selected here is stored as default value for the project.
- 7. Click Click Add selected sensor to project. The sensor now is listed in the secondary sidebar.

#### Note

To include frequently used sensors in your preferred selection:

In the secondary sidebar, under FAVORITE SENSORS list, click 
 The FAVORITE SENSORS list is displayed across all projects.



## 6.3. Configuring System Sensors

1. Click SYSTEM.

Note

parameters.

- 2. In the Select brand box, click PhaseOne
- 3. In the **Select model** box, click the required sensor model. The airplane height and sensor footprint are visualized on the right side of the workspace (see Section 6.4 -Visualization of sensor settings)
- 4. In the **Sensors in model** box, clicking each sensor displays its parameters on the right. These values cannot be modified here.

To view a sensor's details, click **Show configuration**. The **FRAME** page is

displayed with the sensor's

	FRAME	Lidar	PUSHBROOM	STEPPER	SYSTEM
ne	Select brand PhaseOne	MODEL Model name Use custom FOV Left / Right Back / Front	PAS 880	[deg] 0.00 [deg] 0.00	[deg]
	<b>⊕</b> <u>Ш</u>	SENSOR Description Is main sensor	Nadir		1
ng rs on	Select model           PA5 150 - 50mm           PA5 150 - 50mm           PA5 150 - 150mm           PA5 150 - 50mm           PA5 280           PA5 880           PA5 Pana (virtual)	Sensor Roll Pitch Yaw Color	Frame Camera PhaseOne 0x4-280 - 90 mm 0.00 -90.00 0.00 Show configuration	[deg] [deg] [deg]	
	Sensors in model Backward Forward Left Nadar (NIR) Right Nadar (NIR)		Add select	ted sensor to pro	ject

# 7. Click Add selected sensor to

project. The sensor now is listed in the secondary sidebar.

#### Note

To include frequently used sensors in your preferred selection:

In the secondary sidebar, under FAVORITE SENSORS list, click 
 The FAVORITE SENSORS list is displayed across all projects.



## 6.4. Visualization of sensor settings

The right side of the Sensor workspace provides a visual overview of the sensor settings footprint on flat terrain.

1. Under the image, in Display settings, configure the various parameters as required.



#### Note

Changes to the HAGL are transferred to the corresponding geometrical constraints in the camera settings.

In addition to the HAGL, you can adjust the forward and side overlap percentages. The effects of these changes are displayed in the visual overview above the **Display settings**. This is especially useful for sensor systems, enabling a comparison of overlap between nadir and oblique cameras.

#### Note

Overlap estimation is only computed for almost parallel lines. You can define the maximum intermediate angle for which overlaps are calculated in Settings (see Overlap calculation).



6. Configuring the sensors

## 6.4.1 Example - Effect of Changes to Roll, Pitch and Yaw Angle on Visual Overview

Adjust the Roll, Pitch, and Yaw angles and observe their impact on the visual overview:

- 1. Set the **Sensor orientation** to:
  - a. Landscape (roll=0°)
  - b. Portrait (roll=90°).
- 2. Adjust the pitch value, which ranges between:
  - a. pitch=0° (pointing to the horizon)
  - b. pitch=-90° (pointing to nadir).
- 3. Enter the heading that defines the system's direction:
  - yaw=0° (front)
  - yaw=90° (right)
  - yaw=180° (back)
  - yaw=270° (left)

The following image shows a frame using roll=90° (portrait), pitch=-45° (oblique sensor) and yaw=270° (left):





## 6.5. Adding sensors to database

#### 6.5.1 Adding a frame sensor

You can add a new sensor by defining a new model and its configuration (focal length).

#### 6.5.1.1 Adding a new model for a frame sensor

#### To add a new model for a frame sensor:

- 1. In the Navigation bar, click 🕲 and select **FRAME**.
- 2. Perform one of the following options:

#### • To add a new frame model based on an existing model:

- a. In the **Select brand** box, click PhaseOne.
- b. In the **Select model** box, click a model to copy.
- c. Next to the MODEL parameters,

click 된.

HODEL         Sensor pixel size         3.45         [jum]         Sensor pixel size         Sensor pixel size
Name         004-GS 120           Sensor pixel size         3.45         [µm]           Sensor pixel size         3.45         [µm]
Sensor pixel size 3.45 [µm]
Conner width 12758 [av] 44.050 [mm]
Sensor height 9564 [px] 33.000 [mm]
Offset principal point 0.000 [mm] 0.000 [mm]
Max. frames per second 5.00
Name -
Focal length - [mm]
FOV along track [deg]
FOV cross track
GEOMETRICAL CONSTRAINTS
HAGL 0.00 [ft] 0.00 [m]
GSD 0.00 [cm]
Sensor orientation
Roll 0.00 [deg]
90.00 [deg]
Yaw 0.00 [deg]
Sensor orientation     Landscape       Roll     0.00     [deg]       Pitch     -90.00     [deg]       Yaw     0.00     [deg]



#### iX Plan 2024 Operation Guide 6. Configuring the sensors

- d. In the **Select model** box, click the \_\_\_\_\_ (Copy) you created.
- e. Next to the MODEL parameters,

click 🖍 and edit the copied MODEL parameters as required.

FRAME	Lidar	PUSHBROOM	STEPPER	SYSTEM
Select brand PhaseOne	MODEL			_
	Name	iXM-GS 120 [Copy]		s de la
	Sensor pixel size	3.45	[µm]	Ē
	Sensor width	12768	[px] 44.050	[mm]
	Sensor height	9564	[px] 33.000	[mm]
	width / height	0.000	[mm] 0.000	[mm]
	Max. frames per se	cond 5.00		
	CONFIGURATION			
$\oplus$	Name			1
	Focal length	-	[mm]	×
Select model	FOV along track	-	[deg]	+
IXA 180 IXM-100	FOV cross track		[deg]	
XM-100 RSM XM-100 SK				
XM-50 RS XM-50 RSM	GEOMETRICAL CO	NSTRAINTS		
0XM-50 SK 0XM-GS 100	HAGL	0.00	[ft] 0.00	[m]
IXM-GS 120 IXM-GS 120 [Copy] IXM-GS 120 RSM	GSD	0.00	[cm]	
IXM-RS100F IXM-RS150F	Sensor orientation	Landscape		
IXU 1000 IXU 150	Roll	0.00	[deg]	
$\oplus$	Pitch Pitch	-90.00	[deg]	
	Yaw	0.00	[deg]	
Select configuration				
-				
		Add sel	ected sensor to pro	oject
		~~~~		
(+)	ហ៊ា			
Ŭ				

f. Click 🖫.

MODEL					
Name	iXM-GS 120 SuperFast				E.
Sensor pixel size	3.45	[µm]			
Sensor width	12768	[px]	44.050	[mm]	(+µ
Sensor height	9564	[px]	33.000	[mm]	
Offset principal point width / height	0.000	[mm]	0.000	[mm]	
Max. frames per second	7.00				



#### iX Plan 2024 Operation Guide 6. Configuring the sensors

# • To create a new frame model from scratch:

- a. In the **Select brand** box, click PhaseOne.
- b. Below the Select model box,

click⊕.

- c. In the Select model box, click new model.
- d. Next to the MODEL parameters,

click 🖍 and edit the parameters as required.

#### Note

Yellow fields are mandatory. **Sensor pixel size** is calculated automatically after you have entered values for all mandatory fields.



e. After you enter all required

parameters, click 🖾. The model you created is added to the list.

MODEL					_
Name	iXM-GS 120 SuperFast				ET .
Sensor pixel size	3.45	[µm]			
Sensor width	12768	[px]	44.050	[mm]	(+µ
Sensor height	9564	[px]	33.000	[mm]	
Offset principal point width / height	0.000	[mm]	0.000	[mm]	
Max. frames per second	7.00				



#### 6.5.1.2 Adding a new configuration for a frame model

#### To add a new frame configuration:

- 1. Select the model for which you want to add a configuration.
- 2. Perform one of the following options:
  - To add a new frame configuration based on a model's existing configuration:
    - a. In the **Select brand** box, click PhaseOne.
    - b. In the **Select model** box, click the required model.
    - c. In the **Select configuration** box, click a configuration to copy.
    - d. Next to the CONFIGURATION

parameters, click 🗗.

			STEFFER	STSTEIV
Select brand	MODEL			
PhaseOne	Name	VM-G5 120		~
	Name	2.45	1-1	
	Sensor pixel size	3.45	[jim]	. 🗇
	Sensor width	12766	[px] 44.050	[mm]
	Offset principal point	9564	[px] 33.000	[mm]
	width / height	0.000	[mm] 0.000	[mm]
	Max. frames per second	5.00		
① 册	CONFIGURATION			
	Name	iXM-GS 120 - 70 mm		/ľ
	Focal length	70.00	[mm]	
elect model XA 160	FOV along track	26.53	[deg]	
IXA 180 IXM-100	FOV cross track	34.93	[deg]	
KM-100 RSM KM-100 SK				
XM-50 RS XM-50 RS	GEOMETRICAL CONSTR	AINTS		
XM-50 SK XM-GS 100	HAGL	0.00	[ft] 0.00	[m]
XM-GS 120 XM-GS 120 RSM	GSD	0.00	[cm]	
XM-RS100F XM-RS150F	Sensor orientation	Landscape	~	
XU 1000	Roll	0.00	[deg]	
🕀 🤠	Pitch	-90.00	[deg]	
	Yaw	0.00	[deg]	
select configuration 004-65: 120 - 100 rmm 004-65: 120 - 110 rmm 004-65: 120 - 150 rmm 004-65: 120 - 80 rmm 004-65: 120 - 90 rmm 004-65: 120 - 20 rmm 004-65: 120 - 90 rmm	٤	🛟 Add sele	cted sensor to proj	ject



- e. In the Select configuration box, click the \_\_\_\_\_ (Copy) you created.
- f. Next to the CONFIGURATION
  - parameters, click 🖊 .
- g. Edit the copied **CONFIGURATION** parameters.

FRAME	Lidar I	PUSHBROOM	STEPP	ER	SYST	ΓEM
Select brand	MODEL					
PhaseOne	Name	iXM-GS 120				11
	Sensor pixel size	3.45	[µm]			<u>_</u>
	Sensor width	12768	[px] 44.0	50	[mm]	+
	Sensor height	9564	[px] 33.0	00	[mm]	
	Offset principal point	0.000	[mm] 0.00	0	[mm]	
	Max. frames per second	5.00				
① ①	CONFIGURATION					
	Name	iXM-GS 120 - 70 mm [C	[opy]			ľ
	Focal length	70.00	[mm]			Ľ,
lect model A 160	FOV along track	26.53	[deg]			<u>[+]</u>
(A 180 (M-100 (M-100 RSM (M-100 RSM	FOV cross track	34.93	[deg]			
KM-280 KM-50 RS KM-50 RSM	GEOMETRICAL CONSTR	AINTS				
XM-50 SK XM-GS 100	HAGL	0.00	[ft] 0.00		[m]	
KM-GS 120 KM-GS 120 RSM KM-GS 120 SuperFast	GSD	0.00	[cm]			
(M-RS100F (M-RS150F	Sensor orientation	Landscape	~			
KU 1000	Roll	0.00	[deg]			
÷ 🗇	Pitch	-90.00	[deg]			
	Yaw	0.00	[deg]			
elect configuration           004-65 120 - 100 mm           004-65 120 - 110 mm           004-65 120 - 110 mm           004-65 120 - 130 mm           004-65 120 - 130 mm           004-65 120 - 90 mm           004-65 120 - 70 mm           004-65 120 - 90 mm           004-65 120 - 90 mm	ŧ	Add sele	cted senso	r to project		
(+) 111						

h. Click 🖫.

CONFIGURATION			
Name	iXM-GS 120 - 100 mm		
Focal length	10þ.00	[mm]	5
FOV along track	20.78	[deg]	(±)
FOV cross track	27.50	[deg]	



- To create a new frame configuration from scratch:
  - a. In the **Select brand** box, click PhaseOne.
  - b. Below the Select model box,

click  $\oplus$ .

FRAME	Lidar pi	USHBROOM	STEPPER	SYSTEM
Select brand	MODEL			
PhaseOne	Name	XM-RS150F		
	Sensor pixel size	3.76	[µm]	
	Sensor width	14204	[px] 53.410	[mm]
	Sensor height	10652	[px] 40.050	[mm]
	Offset principal point width / height	0.000	[mm] 0.000	[mm]
	Max. frames per second	2.00		
<b>⊕</b> ₫	CONFIGURATION			
	Name	-		
	Focal length	-	[mm]	r i
IXA 160	FOV along track		[deg]	L
XM-100 XM-100 XM-100 RSM	FOV cross track	-	[deg]	
0(M-100 SK 0(M-280 0(M-50 RS 0(M-50 RSM	GEOMETRICAL CONSTRA	шть		
XM-50 SK XM-GS 100	HAGL	0.00	[ft] 0.00	[m]
XM-GS 120 XM-GS 120 RSM XM-GS 120 SuperEast	GSD	0.00	[cm]	
IXM-RS100F IXM-RS150F	Sensor orientation	Landscape		
XU 1000	Roll	0.00	[deg]	
(+) 🔟	Pitch	-90.00	[deg]	
	Yaw	0.00	[deg]	
Select configuration WH451507 - 110 mm 0MH451507 - 150 mm 0MH451507 - 180 mm 0MH451507 - 32 mm 0MH451507 - 32 mm 0MH451507 - 32 mm 0MH451507 - 30 mm 0MH451507 - 30 mm 0MH451507 - 30 mm	Ę	Add sele	cted sensor to proj	iect

c. Under CONFIGURATION, define the Name and Focal length.

PHASEONE

CONFIGURATION			
Name	iXM-RS150F - 100 mm		
Focal length	100.00	[mm]	
FOV along track	22.65	[deg]	[ <u>↓</u> µ
FOV cross track	29.90	[deg]	

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d. Click 🛄. The configuration you created is added to the list.

## Note

Sensor information is always stored in the active project. If the project is shared across multiple iX Plan 2024 installations, the software verifies the availability of sensor information in the database; if not found, it generates it.

#### 6.5.2 Adding a system sensor

You can add a new sensor by defining a new model and its associated sensors.

#### 6.5.2.1 Adding a new model for a system sensor

- 1. In the Navigation bar, click 🗭 and select SYSTEM.
- 2. Perform one of the following options:
  - To add a new system model based on an existing model:
    - a. In the **Select brand** box, click PhaseOne.
    - b. In the **Select model** box, click a model to copy.
    - c. Next to the MODEL parameters,

click 🗗.





- d. In the Select model box, click the \_\_\_\_\_ (Copy) you created
- e. Next to the MODEL parameters

click 🖍 and edit the copied MODEL parameters as required.

#### Note

To modify the FOV values, select the **Use custom FOV** checkbox.

ed	FRAME	Lidar	PUSHBROOM	STEPPER	SYSTEM
ers, red.	Select brand PhaseOne	MODEL Model name Use custom FOV Left / Right Back / Front SENSOR	PAS 150 - 90mm (Copy 0.00 0.00	[deg] 0.00 [deg] 0.00	[deg]
		Description Is main sensor Sensor			✓ + →
	Select model           PAS 150 - 110mm           PAS 150 - 110mm           PAS 150 - 100mm           PAS 150 - 20mm           PAS 150 - 100mm           PAS 150 - 100mm           PAS 150 - 100mm           PAS 150 - 20mm           PAS 150 - 20mm	Roll Pitch Yaw Color	- - Show configuration	(deg) (deg) (deg)	
	Sensors in model		रिंग्रे Add selee	cted sensor to proj	ject
	⊕ <u>†</u>	T			

f. Click 🖫.

MODEL							
Model name PAS 150 - 90mm Super							
Use custom FOV					ā		
Left / Right	-34.84	[deg]	34.84	[deg]	(+µ		
Back / Front	-10.10	[deg]	10.10	[deg]			



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#### • To create a new system model from scratch:

- a. In the **Select brand** box, click PhaseOne.
- b. Below the Select model box, click  $\oplus$ .
- c. In the Select model box, click new model.
- d. Next to the MODEL parameters,

click 🖍 and edit the parameters as required.

Note
To modify the
FOV values, select the
Use custom FOV
checkbox.



#### e. After you enter all required

parameters, click . The model you created is added to the list.

MODEL					
Model name	PAS Pana Super				<b>P</b>
Use custom FOV					ā
Left / Right	0.00	[deg]	0.00	[deg]	(÷µ
Back / Front	0.00	[deg]	0.00	[deg]	



#### 6.5.2.2 Adding a sensor to a model

#### Note

• The sensors for a system model are based on the models and their related configurations (focal length) listed in the FRAME page.

Therefore, before you define a new system (model and sensors in the model), make sure the model and its configurations are defined in the Sensor **FRAME** page.

If necessary, add there a new model and configurations as described in Section 6.5.1 - Adding a frame sensor.

• This option is only available for models and configurations that you created.

#### To add a sensor to a model:

- 1. In the **Select brand** box, click PhaseOne.
- 2. In the **Select model** box, click one of the models that you added.
- 3. Below the Sensors in model box, click  $\oplus$

FRAME	Lidar	PUSHBROOM	STEPPER	SYSTEM		
Select brand PhaseOne	MODEL Model name Use custom FOV Left / Right Back / Front	PAS Pana Super	[deg] 0.00 [deg] 0.00	(deg)		
<b>⊕</b> ₫	SENSOR Description Is main sensor Sensor	new sensor				
Select model           PAS 150 - 90mm           PAS 150 - 90mm           PAS 150 - 100mm           PAS 150 - 100mm           PAS 150 - 100mm           PAS 150 - 00mm           PAS 280           PAS 880           PAS Pana           PAS Pana Suber	Roll Pitch Yaw Color	Show configuration	[deg] [deg] [deg]			
Sensors In model Rev sensor Rev sensor Add selected sensor to project						
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## 4. Under SENSOR:

- a. In **Description**, enter a name for the sensor.
- b. Select the **Is main sensor** checkbox as required.
- c. In the Sensor list, select Frame Camera.
- d. In the next 3 list boxes, select the parameters you require for brand, model and configuration.
- e. In the next 3 fields, define the **Roll**, **Pitch** and **Yaw**.
- f. Select the color to use for the model sensor in the visual overview.



PAS Pana Supe

Ì

# 5. Click 🖫

# 6.6. Deleting sensors from database

# Note

This option is only available for models and configurations that you created.

## To delete a frame sensor model or configuration or a system model or sensor in model:

1. In the Select model or Select configuration or Sensors in model box, select the item to delete.

FRAME

MODEL

Model name

Use custom FO

Select brand

2. Under the box, click  $ar{ar{U}}$ .



# 7. Defining flight lines

This section describes how to use the basic features required for creating a simple flight plan as follows:

7.1. Accessing the Flight Lines Settings	
7.2. Configuring flight line basic metrics	
7.3. Calculating altitude settings	
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7.13. Recalculating flight line(s)	

# 7.1. Accessing the Flight Lines Settings

#### To access and configure general flight line settings:

- 1. In the Navigation bar, click  $\mathcal{U}$ .
- 2. If you added multiple sensors to the project: in the secondary sidebar, under **Sensor**, select the sensor you will use to plan the flight. The **Distance between flight lines** parameter under **Basic metrics** is updated accordingly.

## Note

iX Plan 2024 uses the parameters of the sensor you select to calculate flight lines and trigger points.



# 7.2. Configuring flight line basic metrics

# Note

Any parameters you modify under **Basic metrics** are also modified in the Configuring the sensors.

## To configure flight line basic metrics:

1. In the secondary sidebar, under **Basic metrics**, configure the following parameters:

Parameter	Description
GSD	Ground Sample Distance - the distance on the ground that each pixel in an image represents (the physical size of one pixel in the real world).
	Modifying the GSD adjusts the HAGL accordingly.
HAGL	Height Above Ground Level - the difference between the flight altitude and the terrain height.
	Modifying the HAGL adjusts the GSD accordingly.
Forward [min]	The minimal forward overlap between one image and the next along the flight line. Use this value to ensure the image sequence time is met, i.e. the camera has enough time (depending on the distance/flying speed) to capture each image in regard to its hardware capabilities.
	<ul> <li>Note</li> <li>The first parameter is the minimal forward overlap as a percentage.</li> <li>The second parameter is the minimal distance in meters between 2 image locations. In mountainous regions, you need a low minimal distance to ensure that large variations in terrain over a small distance are captured.</li> </ul>
Sidelap [mean/min]	The mean overlap between two flight lines.
	<ul> <li>Note</li> <li>The first parameter is the mean sidelap as a percentage.</li> <li>The second parameter is the minimal sidelap as a percentage. Modifying the sidelap adjusts the Distance between flight lines accordingly.</li> </ul>
Distance between flight lines	Use a specified portion of the stereoscopic area to calculate the distance to the next flight line. Modifying the Distance between flight lines adjusts the sidelap accordingly.



# 7.3. Calculating altitude settings

## To configure the parameters for the flying altitude and altitude rounding:

1. In the secondary sidebar, under **Calculate altitude from**, select one of the following options:



# Note

These settings (and additional altitude settings) can also be configured in General settings.



# 7.3.1 Altitude rounding

In the secondary sidebar, under **Calculate altitude from**, select the **Rounding** checkbox and define the parameters as follows:

·	
[rounding increment]	The step size used to round the altitude.
[unit]	Specifies whether altitude is measured in feet (ft) or meters (m).
up	Rounds altitude up to the next multiple of the rounding increment. <b>Example</b> : 4711 ft -> 4800 ft for a rounding increment of 100 ft.
down	Rounds altitude down to the previous multiple of the rounding increment. <b>Example</b> : 4711 ft -> 4700 ft for a rounding increment of 100 ft.
closest	Rounds altitude up or down to the nearest multiple of the rounding increment. <b>Example</b> : 4749 ft -> 4700 ft and 4750-> 4800 ft for a rounding increment of 100 ft.

# 7.4. Drawing a flight line

# Note

- Flight line segments are not currently supported by iX Flight Pro.
- Flight lines can only be drawn in areas for which elevation data has been downloaded. In the layers panel, make sure the layer containing elevation data encompasses your area of interest. If it doesn't, navigate to and Updating the elevation model (DTMs).

## To draw a single flight line:

- 1. Before drawing a line, in the secondary sidebar under Calculate altitude from, select and/or check the following constraints:
  - Min. terrain
  - "Max. terrain" on the previous page
  - Mean terrain
  - Terrain following
  - Fixed altitude
  - Altitude rounding



# Note

In areas with significant terrain variations it can be useful to have multiple flight line segments, each with a different elevation. Go to 🐼, select **Flight lines** and select the **Allow line stepping** checkbox. Specify above which difference in height iX Plan 2024 may apply line stepping automatically.



- 2. Click ---.
- 3. In the workspace, click the location where the flight line begins.
- 4. Move the mouse to the location where the flight line ends and click again.
- 5. To continue drawing a new segment of the flight line, move the mouse as described in the above steps. Otherwise, right-click the map.

# Note

If a buffer was added to the AOI, the flight line extends to the buffer perimeters.

Flight line identification is based on two integer numbers (example: 35-2). The first represents the flight line and the second the segment (or part) of the flight line. It is possible to Setting the IDs of flight line(s). For wide area planning, all lines with a common first number are on a straight line.





# Note

For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.



# 7.5. Editing flight line(s) and segments

# Note

Flight line segments are not currently supported by iX Flight Pro.

## To edit a flight line:



- 2. Select the required option from Select options.
  - Edit vertices of a single line and Move line parallel enable the modifications Fix azimuth and Fix height options under Modify options.
  - Single segment, Multiple segments and All segments enable all options but Fix azimuth and Fix height.
- 3. Select the Type by choosing For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.
- 4. Select the required unit **m** or **ft**.
- 5. Adjust the **Modify options** as required.
- 6. Apply the options that you modified as follows:
  - Edit vertices of a single line: left-click the line you want to edit.
  - Move line parallel: left-click the line and drag it parallel, then left-click again to finalize its placement.
  - Single line: left-click the line you want to edit.



#### • Multiple lines



• All lines: click the workspace and in the message that appears, confirm that you want to continue.

# 7.6. Deleting flight lines

## To delete flight lines:

- 1. Click 🔟 .
- 2. Select the required option from Select options.
  - Single line: left-click the line you want to delete.
  - Multiple lines: left-click and drag the mouse across the lines you want to edit. Use the default to employ the rectangle tool. When you release the mouse button, the lines are deleted.
  - All lines: click the workspace and in the message that appears, confirm that you want to continue.

# 7.7. Setting a buffer around an AOI

It is recommended to add a good buffer around the AOI (minimally the surrounding flight altitude length), especially when planning an oblique mission.



## To set a buffer around the AOI:

# Note

While the AOI is selected

- it is not possible to draw lines outside the perimeter.
- every new flight line inside the AOI is extended to the border of the AOI.
- 1. Click 🔬 .
- 2. Enter the required buffer in meters.
- 3. Click the AOI that will be buffered.

A new border (default color: yellow) appears around the AOI.

# 7.7.1 Extending flight lines beyond the AOI

When adding flight lines, you can specify if and by how much the added flight lines extend beyond the AOI. The option you select applies to both to parallel added flight lines as well as flight lines that you draw manually.

## To extend added flight lines beyond the AOI:

- 1. Click 🛓 .
- 2. Select the AOI.
- 3. Select the Extend lines beyond AOI checkbox.
- 4. Configure the required extension options as follows:
  - In line direction select the checkbox and enter the maximum distance beyond the AOI in which the added line can extend in the same direction as the copied line.
  - **Parallel to lines** select the checkbox and enter the maximum distance beyond the AOI in which the added line can extend in parallel to the copied line.
  - Sensor Footprint based on HAGL lines that you add extend beyond the AOI according to the sensor footprint. This option automatically selects the above two checkboxes and adjusts the line extension distance accordingly.

# 7.8. Adding flight lines automatically

# Note

- Flight line segments are not currently supported by iX Flight Pro.
- At least one flight line must be present before you can add additional lines automatically.



# 7.8.1 Copying a flight line

# Note

You can specify if and by how much the added parallel flight lines extend beyond the selected AOI (see Section 7.7.1 - Extending flight lines beyond the AOI).

## To copy a flight line:

- 1. Click +.
- 2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.
- 3. Click Copy flight line.
- 4. Click Parallel copy.
- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target line.
- 6. Click the source flight line.
- 7. Move the mouse up or down to the target location and click the map to create the target line.

## To copy a flight line to a fixed distance from the source line:

- 1. Click +.
- 2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.
- 3. Click Copy flight line.
- 4. Click **Parallel copy** and enter the distance in meters that the new line will be from the source line.
- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL) of the source line to the target line.
- 6. Click the source flight line.
- 7. Move the mouse up or down to the target location (fixed distance) and click the map to create the target line.

## To copy a flight line in line with the original line:

- 1. Click +
- 2. Select For various flight line modifications described in the following chapters, you can opt to alter either the entire line (comprising all segments) or a single segment.
- 3. Click Copy flight line.
- 4. Click In line copy.
- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target line.
- 6. Click the source flight line.
- 7. Move the mouse right or left to the target location and click the map to create the target line.



# 7.8.2 Filling a shape with parallel lines

# Note

You can specify if and by how much the added parallel flight lines will Extending flight lines beyond the AOI.

## To fill all of a selected shape with parallel lines:

1. Select the shape you want to fill.

# Note

At least one flight line must be present in the selected shape.

- 2. Click +.
- 3. Click Parallel lines.
- 4. Click Fill whole selected shape.
- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
- 6. Click the flight line you want to copy (original). The selected shape is filled with lines that are parallel to the line you selected.

## To fill the selected shape to the left or right of an existing flight line:

1. Select the shape you want to fill.

# Note

At least one flight line must be present in the selected shape.

- 2. Click 🕂.
- 3. Click Parallel lines.
- 4. Click either Fill selected shape left of the line or Fill selected shape right of the line.
- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
- 6. Click the flight line you want to copy (original). The "left" or "right" side of the selected shape is filled with lines that are parallel to the line you selected.

## To add a fixed number of flight lines in the selected shape to the left or right of an existing flight line:

1. Select the shape you want to fill.

# Note

At least one flight line must be present in the selected shape.

2. Click +.

- 3. Click Parallel lines.
- 4. Click Add lines and enter the number of lines you want to add in the Left and/or Right boxes.



- 5. Scroll down and select the **Use altitude from the reference flight line** checkbox to apply the flight altitude (not HAGL!) of the source line to the target lines.
- 6. Click the flight line you want to copy (original). The "left" or "right" side of the selected shape is filled with the number of lines you specified up till the AOI perimeter.

# 7.9. Breaking a flight line

Flight lines can be broken when it is necessary to change the image scale due to terrain. After a line is broken, each section is recomputed and gets its own flight height.

## To break a flight line into two sections:

1. Click .

- 2. Set the required overlapping constraints (distance or images).
- 3. Click the flight line at the location where you want it to be slit into two lines.

# 7.10. Modifying the altitude of flight line(s)

## To modify the altitude of flight lines:

- 1. Click **I**.
- 2. Select the required option from Select options.
  - Single line left-click the line you want to modify.
  - Multiple lines left-click and drag the mouse across the lines you want to modify. Use the default to employ the rectangle tool. When you release the mouse button, the lines are modified.
  - All lines click the workspace and in the message that appears, confirm that you want to continue.
- 3. Select the altitude units display to **m** or **ft**.
- 4. Select the update method:
  - Fixed altitude sets the altitude to the value you enter.
  - Round altitude rounds the current altitude to the nearest value you enter.

# 7.11. Modifying the direction of flight line(s)

#### To modify the direction of flight lines:

- 1. Click д .
- 2. Select the required option from **Select options**.
  - Single line left-click the line you want to modify.
  - Multiple lines left-click and drag the mouse across the lines you want to edit. Use the default to employ the rectangle tool. When you release the mouse button, the lines direction are modified.
  - All lines click the workspace and in the message that appears, confirm that you want to continue.



# 7.12. Setting the IDs of flight line(s)

#### To set the IDs of flight lines:

1. Click 💋.

- 2. Select the required option from Select options.
  - Single line enter the value of the new ID and left-click the required line.
  - **Multiple lines** enter the values for the first new line ID and the increment by which to increase the ID of the other lines, then left-click and drag the mouse across the lines you want to renumber. Use the default to employ the rectangle tool. When you release the mouse button, the lines are renumbered.

# 7.13. Recalculating flight line(s)

The recalculation methods use the current **Basic metrics** displayed in the secondary sidebar.

#### To recalculate flight lines:

- 1. Click 🗱.
- 2. Select the recalculation method:
  - Single line left-click the line you want to recalculate.
  - Multiple lines left-click and drag the mouse across the lines you want to recalculate. Use the default to employ the rectangle tool. When you release the mouse button, the lines are recalculated.
  - All lines click the workspace and in the message that appears, confirm that you want to continue.
- 3. Select the required recalculation method:
  - **Recalculate whole flight line** only start and end points from the existing flight line are used to freshly calculate the flight line based on the current settings for:
    - Sensor
    - HAGL/GSD
    - Forward overlap
  - **Recalculate image positions** flight line geometry remains the same. Only image positions are recalculated based on the current settings for:
    - Forward overlap
  - Recalculate footprints only footprints between flight lines are recalculated.
  - Recalculate overlaps only overlaps are recalculated.

## Note

This function is a powerful tool if you want to make partial changes to the flight plan.

**Example** for adjusting the forward overlap of a single line:

- 1. Create all flight lines using parallel copy and the standard configuration.
- 2. Under Basic metrics, enter a new forward overlap value.
- 3. Recalculate image positions for one or more lines as described above.



# 8. Performing Quality Control

This section describes how to add layers with color-coded maps for quality control checks of generated flight lines as follows:

8.1. Critical reasons for QC checks	
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# 8.1. Critical reasons for QC checks

iX Plan 2024 enables you to perform several quality control (QC) checks to assist you in evaluating if your flight plan meets the project requirements. These checks appear as an overlay over the map in the layers panel.

QC maps are georeferenced TIFF files stored in the project folder and serve the following functions:

- During the planning if you are planning a flight over difficult terrain with highly restricted project requirements (such as small tolerances for minimal and maximal GSD, or low tolerance for point density variation), you can create a QC-map over a portion of the area to check whether you fulfill the project criteria or if you must add extra lines locally.
- Final proof of the flight plan QC maps are frequently used as an important part in a project proposal or quote to show the customer that the flight plan fulfills all project requirements.

# Note

QC maps give a far better understanding of the flight plan quality than statistical values. For example, the flight line statistics show that the GSD exceeds the maximal allowable GSD. But the QC maps shows that the portion of the flight line where the GSD is too high is where the line crosses a valley and adding another flight line along the valley will compensate for the high GSD. For this reason, it is recommended to present QC maps instead of statistics on single flight lines.

# 8.2. Types of QC maps

Quality control maps can be generated for:

- HAGL (Height above ground level) used especially in mountainous areas for low height flights to check if flight lines are not too close to mountain ridges or if the airplane has enough space in deep valleys to turn into the next line.
- Sidelap the lateral overlap of terrain by two or more flight lines. Click **Units** and click **Forward overlap [%]** for the resulting map to contain the best ratio of two adjacent image footprints on the same flight line.
- Amount of overlaps number of lateral overlaps. Click Units and select whether to compute the number for Lines or Images.
- GSD (Ground sample distance) shows the GSD in different colors for each location.



• Radial object displacement - the wider the lens angle, the greater the resulting image displacement (building lean) in an image. A camera with a wide-angle lens requires much more lateral overlap between flight lines than a camera with a narrow FOV. Therefore, modern project requirements do not define a minimal lateral and longitudinal overlap anymore. Instead, the requirements specify a maximal building lean value (for example, a maximal allowable building lean of 20% means that a building of 10 m height shall not cover more than 2 m of the underlying terrain). The image displacement QC map shows if the overlap is correctly set to remain under the given maximal value.

# 8.3. Creating QC maps

For each QC check, you can define how the check results are displayed in the map panel, such as color thresholds, units of value legend placement and grid resolution.

How to create a QC map

- 1. In the Navigation bar, click  $\mathfrak{B}$ .
- 2. In the secondary sidebar, under **Sensor selection**, select the sensor for which you wish to perform a quality check.

## Note

- In projects with only one sensor, it is selected by default.
- If you selected a system sensor, in the second list you can also select one or more individual sensors of the system.

#### 3. Select the type of QC map as follows:

- 🚧 Height above ground level (HAGL)
- 🕈 🔟 Sidelap
- Amount of overlaps
- 🖩 Ground sample distance (GSD)

# 🗄 Radial object displacement

4. For each QC map type, a configurable legend appears with suggested colors and corresponding value ranges.

To modify individual ranges, click a row, update the minimum, maximum, and optionally, the legend, and then click the + symbol to the left of the box.

## Note

For GSD maps, all areas below the GSD selected in the Flight lines settings are colored green. It is recommended to adjust the value range so that areas with a marginally larger GSD are included in this range as well.

5. In the **Units** list, select the required unit of measurement.



6. Scroll down and click Create map.



7. In the layers panel, click the new map layer and drag it to the top so that it will be displayed in the foreground.

## Note

Modify the color map transparency value to enhance background base map visibility. Simply double-click the layer and adjust the transparency value.

# 8.4. Adjusting the grid

In the secondary sidebar, you can adjust the grid resolution and grid extent.

Grid resolution			
O Screen Resolution: 12 Meters			
200 Meters			
Grid extent			
• Visible extent			
O Area covered by flight lines			
O Area covered by selected layer			



# 8.4.1 Grid resolution

1. Under **Grid resolution**, adjust the resolution of the QC map.

#### Note

- The screen resolution depends on the current zoom level in the workspace.
- For an initial impression, a resolution of 200 m is recommended. A higher resolution requires more computing time.

# 8.4.2 Grid Extent

#### To select the grid extent:

- 1. Select one of the following options as required:
  - the visible extent
  - the area covered by flight lines
  - the area covered by layer selected in the layers panel

# 8.5. Displaying individual raster element values

In the status bar, you can change the default selection from Terrain to a QC map that was generated, such as GSD. The **Cell value** will then reflect the GSD value of the raster element that the mouse is hovering over.

				Terrain	1 VE CALEM
				Sidelap	
				GSD	-
32629	X : 525910.6772   Y : 4239456.4569   Z: -1.0 (-3.3 ft)	WGS84	Lat : 38° 18' 10.17" N   Lon : 8° 42' 13.17" W	Terrain 🗸	Cell value: -



# 8.6. Creating an image file

QC maps are generated as raster maps, not images.

#### To configure the QC map output settings:

1. Under Output settings, select the required settings.

#### Note

You can also right-click the QC map layer in the layers panel and click **Save Layer as Image** to open a window with the output settings.

Output settings					
✓ Create image from QC map					
File type	.png 🗸				
Image width [px]	1200				
Legend position	Top left 🛛 🗸				
Legend Scale [%]	20				
Add to map					
Output layer name	HAGL				
Add statistics to legend					

2. To display the image in your workspace, select the **Add to map** checkbox. A new layer with the ending \_ export will be added in the layers panel.

#### Note

- The georeferenced image is automatically saved in the project folder.
- The data for the image file is rendered and is not in the raw, original layer format.

To enhance your legend by adding statistics regarding the percentage of area within each value range:

1. Under Output settings, click the Add statistics to legend checkbox.



# 9. Performing Queries

This section describes how to gain a deeper understanding of your flight plan by using the tools available in the **Queries** page as follows:

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## To access the Queries tools:

- 1. In the Navigation bar, click W Queries.
- 2. At the top of the Queries sidebar, click the tool you require (from left to right):
- 📼 🖾 🅢 🔅

- Imm Measure distances and areas
- 🖾 Image position queries
- 🅢 Flight line queries
  - 🔅 Sun elevation queries

# 9.1. Measuring distances and areas

# 9.1.1 Measuring distances

Determine the distance between two points on the map using the built-in measurement function. Use this feature to precisely measure distances and to gain insights into height differentials and azimuth values for your planning and analysis requirements.

## To measure distances:

- 1. At the top of the secondary sidebar, click III.
- 2. Click Distance.
- 3. On the map, click the measurement starting point.



 Move your mouse cursor across the map to the required endpoint. As you progress, the distance measured is displayed near the cursor and the MEASURED VALUES in the secondary sidebar are updated.



5. Right-click the map to end the measurement.

# 9.1.2 Measuring areas

iX Plan 2024 provides a useful tool to measure the extent of areas.

# To measure areas:

- 1. At the top of the secondary sidebar, click III.
- 2. Click Area.
- 3. On the map, click the first point of the area. A first vertex for the polygon becomes visible.



4. Click all the positions to form your required polygon. Once your polygon comprises more than two vertices, measurement values for the area appear in the secondary sidebar. Additionally, a histogram showing the height distribution within the specified area is presented, with a vertical line indicating the average terrain height.



# Note

To adjust the polygon, move the vertices as follows:

- Click the vertex you want to move. The vertex will become red.
- Drag the vertex to its new destination.
- The polygon with the dashed line and the measurement values are updated.
- 5. Right-click the map to end the measurement.



# 9.2. Performing image position queries

Image sequence queries menu offers different methods for selecting image positions.

#### Note

The correct layer must be at the top of the layer panel for this feature to operate properly.

You can perform different image position queries based on the following main types:

- Spatial based on an area you select (either rectangle or polygon).
- Attribute based on criteria you select related to image parameters.
- Image sequence based on the criteria you select related to image capture parameters.

#### Note

After performing the query, use the selection to modify your flight plan (see Section 9.2.4 - Selection Actions).

# 9.2.1 Image position queries - spatial type

#### To perform queries based on an area you select on the map (Rectangle or Click polygon):

- 1. At the top of the secondary sidebar, click  $\overleftarrow{\mathcal{B}}$ .
- 2. Under **Select by**, click the required option for specifying how to perform the selection for the spatial query:
  - **Rectangle** drag the mouse on the map to select an area.
  - Click on polygon click an existing defined area on the map.
- 3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.
- 4. Select one of the following geographical context options:
  - **Inside:** All image positions/footprints will be selected if the point or footprint is entirely inside the reference area. The shape will not be selected if it touches the reference area.
  - Intersecting: Image positions/footprints that fall within or touch the reference area will be selected.
  - Outside: Image positions/footprints that fall outside of or do not touch the reference area will be selected.
- 5. Run the query as follows:
  - **Rectangle** drag the mouse to select an area.
  - Click polygon click an area that is already defined.

All image positions matching the query are selected and highlighted on the map. and the total appears under **SELECTION STATISTIC** in the secondary sidebar.





# 9.2.2 Image position queries - attribute type

#### To perform queries using equations based on the area properties:

- 1. At the top of the secondary sidebar, click  $\overleftarrow{\mathcal{M}}$ .
- 2. Under Select by, click Attribute.
- 3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.

#### 4. Under Attribute:

- a. Click the left list and click an attribute.
- b. Click the middle list and click an operator.
- c. Depending on the attribute you selected in the left list, either enter a value (for numeric fields, e.g. height) or click a list (for enumerated fields, e.g. Line ID).
- 5. Click **Add constraint** to add an additional row or rows. Define the new constraint as described in the previous step.
- To run the query, click Make selection. All image positions matching the query are selected and highlighted on the map. and the total appears under SELECTION STATISTIC in the secondary sidebar.
- 7. To reset the query, click Reset constraints.

# 9.2.3 Image position queries - image sequence type

To perform queries that check the space between two image trigger points on the same flight line to ensure it adequately aligns with the camera capture rate limitation:

- 1. At the top of the secondary sidebar, click  $\stackrel{}{E\!\!\partial}$
- 2. Under Select by, click Image sequence.
- 3. Under **Based on**, select whether the function should be based on the **Image position** or its **Footprint**.
- Under Constraints, enter values for the Flight speed [kts] and Max. fps according to the airplane and camera, respectively. The system calculates and displays the Max. speed that can be flown based.
- 5. To run the query, click **Select problematic positions**. All image positions matching the query are selected and highlighted on the map. and the total appears under **SELECTION STATISTIC** in the secondary sidebar.

# 9.2.4 Selection Actions

You can use the query results (point selections) to:

• Delete areas with unwanted image points, e.g. where no pictures may be taken.

	// ×			
Select by				
○ Rectangle	O Click on polygon			
○ Attribute	Image sequence			
Based on Image position O Footprint Constraints				
Flight speed [kts]	160.00			
Max. fps	1.00			
Max. speed	1231.37 kts			
Select problematic positions				



I	יוייי	63	1	//	- <u>ò</u> -	
Se	elect by					
(	⊖ Recta	angle		⊖ <mark>C</mark> li	ck on polygon	
1	Attri	bute		⊖ Im	age sequence	
Ba	ased on					
	🖸 lmag	je positio	n	⊖ Fo	otprint	
A	ttribute					
	Line ID	~	=	~	10-1	~
	Height	~	>	~	6010.00	
Add constraint Reset constraints						
Make selection						

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- Shorten flight lines.
- Modify flight lines in areas where image points do not meet your requirements.

#### To perform actions based on the query result:

- 1. Click the buttons below SELECTION STATISTIC as required:
  - Unselect points
  - make an inverse selection
  - delete selected image positions
  - delete positions and shorten lines
  - export the selection to a temporary layer which will appear in the layers panel.





# Caution

• Data point deletion cannot be undone! Click **Delete selected items** only if you are certain that your selection is accurate.

If uncertain, use the Save as option and save the project under a different name before deleting items.

• Automatic flight line recalculation (see Section 7.13 - Recalculating flight line(s)) can be performed for accidentally deleted image points. However, you will need to manually fix shortened flight lines.



# 9.3. Flight line queries

Running flight line queries is similar to running image position queries except:

- Linetype replaces Image sequencetype. Select specific lines by clicking and then dragging the mouse (spatial relation is not available).
- Flight line replaces Image position.
- The **Attribute** list is larger.

#### To perform flight line queries:

- 1. At the top of the secondary sidebar, click  $\mathscr{U}$ .
- 2. Use the same methodology described in Section 9.2 Performing image position queries),

	<mark>∕∕∕</mark> ☆
Select by	
○ Rectangle	O Click on polygon
◯ Attribute	O Line
Based on	
<ul> <li>Flight line</li> </ul>	○ Footprint
Spatial relation	
Inside	
<ul> <li>Outside</li> </ul>	

# 9.4. Sun elevation queries - knowing when to fly

The sun's elevation angle dictates the time window for the flight, spanning from sunrise to sunset. In addition, it is also a crucial determinant for capturing high-quality images. During low sun angle degrees shadows become excessively long and thus reduce the image quality. Large sun angle degrees during mid-day can cause reflections (particularly from water bodies) that become overly intense, leading to potential issues like cross-fade. Therefore, knowing the optimal time window for the flight is essential for obtaining the best outcome.

## To determine optimal flight times:

- 1. At the top of the secondary sidebar, click  $\dot{\mathfrak{R}}$  .
- 2. Click either **Map center** or **Mouse click** to automatically fill out the coordinates.

You can also enter the coordinates into the respective windows above the buttons.

- If required, modify the UTM time zone by entering a value in UTC offset. The REQUIRED SUN ANGLE graph below will update accordingly.
- 4. Under **Required sun angle**, enter your minimum and maximum criteria in degrees.

	-ờ:-
Coordinates	
Longitude [deg]	-9.00307
Latitude [deg]	38.72807
Map center	Mouse click
UTC time zone	
UTC offset	2.0
Required sun angle	
Minimal criteria [deg]	10.0
Maximal criteria [deg]	90.0



The **REQUIRED SUN ANGLE** graph, illustrating sunrise, sunset, and the minimum and maximum sun angle criteria throughout the entire year, is updated.

- 5. To obtain a larger image that can be copied to the clipboard, click the graph.
- 6. Move the mouse over the diagram to show the flight time window for individual days of the year. If sun angle requirements exclude mid-day times, two time window boxes are shown.





# **10. Configuring Settings**

This section describes how to configure various general settings in the Settings page as follows:

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# Note

You can also modify many settings iX Plan 2024 display and flight line settings in the various secondary sidebar menus and in the layers panel.



# 10.1. General settings

#### To access Settings:

1. In the Navigation bar, click 🔯	Settings			- 0	×	
Settings. The Settings window appears.	Settings     Osplay settings     Flight lines     Elevation data     Units	Layer styling Layer style folder Grid settings	C:\ProgramData\PhaseOne\}XPlan 2024.0\config Restore default layer styling			
		C	Draw grid using	Global Coordinate System (Latitude/Longitude)       0     • 15       10000     Map units       Update grid	~	
	Logging Open log at st Automatic log Log folder	Logging Open log at startup Automatic log saving Log folder	☐ ☑ C: ProgramData PhaseOne INPlan 2024.0 μogs			
			Clear 42 log files Open folder with logs Open log window			
			× Cancel	ОК		

The Settings window has a navigation panel with the options below described in this section:

- Display settings
- Flight lines
- Elevation Data
- Units (reserved for future use)



# 10.1.1 Display settings

#### To access the Display settings:

- 1. In the **Settings** window navigation panel , click **Display settings**.
- 2. Configure the settings as described below.
- 3. Click OK.



#### 10.1.1.1 Layer styling

Under Layer styling, you can:

- Configure the path to the directory with your personalized layer styling (see Section 10.2 Customizing layers).
- Click Restore default layer styling to revert to the default styling.

# 10.1.1.2 Grid settings

#### To change grid display parameters:

- 1. Under **Display settings**, select the **Draw grid** checkbox.
- 2. Configure the coordinate system and the grid spacing options.
- 3. Click Update grid.



#### iX Plan 2024 Operation Guide 10. Configuring Settings

## 4. Click OK.



#### Map scale

#### To define the scale of a map:

- 1. In the workspace, click the scale at the bottom-right corner.
- 2. In the Input window, define the map scale (for example: 1:50000).

1.5 km

## 10.1.1.3 Logging

Under **Logging**, you can:

- Toggle the **Open log at startup** checkbox.
- Toggle the **Automatic log saving** checkbox.
- Define the Log folder location.
- Click Clear XX log files to delete log files.
- Click **Open folder with logs** to access the log files.
- Click **Open log window** to display the latest log messages and perform the following actions:
  - Click **Save logfile** to save these messages to a file.
  - Click Clear logfile to delete the displayed messages.
  - Click Logging level to filter the shown messages by severity (Error / Warning / Info / Debug ).

## Note

Some log messages can be used for flight line and point editing.



# 10.1.2 Flight lines

#### To access the Flight lines settings:

- 1. In the **Settings** window navigation panel , click **Flight lines**.
- 2. Configure the settings as described in the sections below.
- 3. Click OK.



## 10.1.2.1 Flight line settings

The main flight line settings are described following:

Flight line setting	Description
Min. flight line length [m]	All flight lines will be at least this long. Use this setting to make sure all calculated flight lines are long enough for reasonable flight maneuvering.
Min. gap length [m]	The gap between two flight lines will be at least this wide.
Min. HAGL [m]	All calculated flight lines will be at least this high above the ground level. This ensures that the averaged flight line heights will be at least the specified height of meters above, for example, any mountain peaks.
	<b>Caution</b> This parameter overwrites the HAGL set in the sensor configuration (see Section 6 - Configuring the sensors).
Image pts/side	Determines how many points are calculated between the footprint corner points. Recommended setting: 1. Increasing this number will increase the computation time.
Extend flight line to the last image center	Select to maintain the required image overlap even for the last point of the flight line.
Line numbering	Set to Increase parent ID.
Image numbering	Select whether the image identifiers should commence at 1 for each line or have continuous numbering for the entire project.

# PHASEONE

# 10.1.2.2 Flying height calculation

• Flying height lines are calculated according to the method you select (displayed on the right) as follows:



• To enable steps in height in an individual flight line, select the **Allow line stepping** checkbox and configure the value for **Step lines if terrain difference threshold is bigger than:** . This can be useful when there are large differences in height along a flight line and the mean terrain elevation becomes unsuitable.

# Caution

Use Line stepping with caution since it interferes with the minimum HAGL.

# 10.1.2.3 Terrain following mode

When image positions are imported via CSV, iX Plan 2024 automatically generates flight lines. iX Plan 2024 requires clarification whether the positions are at the same flying altitude or were planned in terrain following mode.

Set the percentage of HAGL to manage the threshold.

## Note

On CSV imports, specify the threshold (% of HAGL) iX Plan 2024 uses to identify terrain variations.



# 10.1.2.4 Overlap calculation

You can define the maximum intermediate angle between flight lines for which overlaps will be calculated in order to include or exclude adjacent flight lines.

#### To adjust the intermediate angle for overlap calculation:

- 1. Adjust the value of the angle in degrees. A low value includes only nearly parallel lines, while a higher value also considers lines that are less parallel.
- 2. Click OK.
- 3. Recalculate the overlaps with the updated settings (see Section 7.13 Recalculating flight line(s))

# 10.1.3 Elevation data

#### To access the Elevation data settings:

- 1. In the **Settings** window navigation panel , click **Elevation data**.
- 2. Configure the settings as described below.
- 3. Click OK.



## 10.1.3.1 SRTM Download

Set the following elevation data properties:

• SRTM Download Path - specifies the folder where SRTM files that you download for your projects are saved. You can modify the folder location.

## Caution

Do not specify a folder that you cannot always access, such as on a server.

• SRTM no data value - specifies the value in meters to use when SRTM data is not available, such as above an ocean. Default value: O

## 10.1.3.2 SRTM Coloring

Set the color scheme for differentiating between different altitudes in the SRTM data.



# Note

The terrain color map you select will come into effect only after you redownloaded the SRTM elevation model.

#### 10.1.3.3 Vertical Datum

- Use EGM96 Geoid (recommended) the height reference system of the SRTM tiles and most other elevation data.
- Reduce to WGS84 ellipsoid reduces SRTM data from EGM96 Geoid to WGS84 ellipsoid.

## Caution

Your flight plan altitude values will be based on the WGS84 ellipsoid. Verify that your GPS/IMU settings are configured accordingly.

# 10.2. Customizing layers

To access various layer options such as the name of the layer or its transparency, in the layers panel either:

- double-click a layer.
- right-click a layer and click Layer properties.

#### Note

To change the front-back stacking order of layers, drag each layer up or down as required.





# 10.2.1 Customizing layer properties

You can define and save the properties of symbols, lines and other elements used in the individual layers.

## 10.2.1.1 Personalizing markers

#### To personalize markers:

- 1. Open the required layer properties window.
- 2. Click **General** to select and modify the various parameters as required, such as the name of the layer or its transparency.



3. Click **Section** to customize items such as the color and style of markers, areas and lines. The example at right shows customized image position markers.





# 10.2.1.2 Personalizing labels

#### To personalize labels:

- 1. Toggle the **Visible** checkbox in the respective item to hide or display its label on the map. The example at right shows customized labels.
- 2. In the layers panel, right-click the layer name and click **Save as default style** to apply your style to any subsequent markers, areas or lines.



# 10.2.2 Saving layer styles

#### Saving layer styles:

- 1. In a Layer properties window, in the bottom left corner, click  $\square$ .
- 2. Enter a name for your layer style and click **Save** to save it as a TatukGIS layer Style file (\*.ttkstyle).

# 10.2.3 Loading layer styles

#### Loading saved layer styles:

- 1. In a Layer properties window, in the bottom left corner, click the folder icon.
- 2. Select the path and name of the layer style file.
- 3. Click Open.
- 4. Click OK or Apply.

# 10.2.4 Deleting layers

Before deleting a layer, a message appears asking whether to delete the entire file from the project folder (**Yes**) or just remove the layer from the layers panel (**No**).

# 10.2.5 Zooming to layers

#### To fill the workspace to the extent of a layer:

• Right-click a layer name and click **Zoom to layer**.

## Note

• Avoid zooming to the base map layer, as it will zoom out to the map view of the entire Earth.


#### To reset the project extent:

- 1. In the workspace, adjust the view by zooming in or out to capture the required project extent.
- 2. In the Navigation bar, click **Project**.
- 3. In the secondary sidebar, under PROJECT SETTINGS, click Set project extent.
- 4.  $\begin{bmatrix} \mathbf{x} \\ \mathbf{y} \end{bmatrix}$  is now reset to the selected area.

### 10.3. 3D view mode

You can get a more comprehensive perspective of your flight plan through 3D visualization.

#### Note

Prior to switching to the 3D mode, configure the current 2D view to display the content you wish to observe in the 3D mode, such as clicking  $\sum_{n=1}^{\infty} \sum_{i=1}^{n}$  for displaying the entire project extent.

#### To activate 3D view:

- 1. In the workspace top left corner, click (3D)
- 2. Click and hold the left mouse button to manipulate and rotate the perspective.

#### Note

The 3D view is only applied to layers for which it has been activated.

#### To activate the 3D view for individual layers:

- 1. In the layers panel, double-click the required layer (such as ImagePosition or FlightLines).
- 2. Under Sections, click 3D.
- 3. Click Treat layer as 3D Object.
- 4. Click Apply then click OK.

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# 11. Import options

You can import a variety of data into iX Plan 2024, such as external flight lines, image data from a flight and FAA Charts.

#### To import files:

• Select **X** Project in the Navigation bar. Use the IMPORT section of the secondary sidebar and select the required file.

OR

• simply drag-and-drop the file directly into your Workspace. A variety of file formats are fully supported.

#### Note

Before importing, Configuring the sensors!

# 11.1. Importing images

You can import image data from a flight into iX Plan 2024. For each image, the data includes its number and position coordinates. The raw GPS coordinates can then be used to check the planned vs actual image center positions.

Another use for imported image data is to check the entire geometry of the actual flight using the measured GPS coordinates of the image positions.

To perform post flight QC, copy the flight plan directory from the flight computer to the computer where you will perform QC. During flight, the flight plan directory stores data for use in this process.

# 11.2. Importing FAA Charts

#### Download and import FAA Charts:

- 1. Go to <u>FAA.</u>
- 2. Download the GEO-TIFF file for the required region.
- 3. Drag-and-drop the files into the workspace.



# 12. Exporting Projects

This section describes how to prepare an iX Plan 2024 project for importing by iX Flight Pro, and how to export iX Plan 2024 project data to the most commonly-used formats as follows:

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12.3. Exporting to Excel	
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12.3.1.6 Variables List	
12.4. Exporting data as KML	
12.5. Printing a flight plan (PDFs)	
12.6. Exporting data as text file	

# 12.1. Preparing an iX Plan 2024 Project for iX Flight Pro

To prepare an iX Plan 2024 Project for importing into iX Flight Pro:

- 1. In the layers panel, right-click the P1 Basemap.
- 2. Click Save Layer as Image.



- 4. Navigate to the project folder, provide a file name and in the Save as type list, click TIFF.
- 5. Click OK.

# 12.2. Exporting data as an ESRI Shapefile

#### To export data to an ESRI Shapefile:

- 1. In the Navigation bar, click **Export**.
- 2. Click ESRI Shapefile.
- 3. Select the required attribute checkboxes or click Select all.
- 4. Change the path and file name, if necessary.
- 5. Click Export.



# 12.3. Exporting to Excel

#### Note

To enable iX Plan 2024 to export a file to Microsoft Excel, the following are required on your PC:

- Microsoft Excel 2002 (v10.0) or higher.
- In the Microsoft Excel Trust Center (or equivalent location in your version of Microsoft Excel), enable Trust Access to VBA project object model.

It is recommended to export the data to a template that has predefined fields for e.g. line number, coordinates, focal length and overlap.

#### To export data to Microsoft Excel using an existing Microsoft Excel report:

1. In the Navigation bar, click  $\longrightarrow$  Export.

- 2. Click Excel.
- 3. In the main window template list, select a template.
- 4. Under Sensor selection, select your sensors.
- 5. Change the path and file name, if necessary.
- 6. Click Export.

#### 12.3.1 Creating a customized Excel template

#### 12.3.1.1 Basic principle

iX Plan 2024 uses Excel templates and substitutes the variables found within the template with the corresponding values set in the active project. For the export of flight lines iX Plan 2024 creates a table that then is copied into the template. The Excel spreadsheet is fully customizable and supports adding images.

#### Note

It is recommended to use an existing template and customize it to your specific requirements as explained below.



#### 12.3.1.2 Defined sections

Not all template variables are populated during Excel export. Specify a designated area within the template where these variables can be located. The available areas are listed here:

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20		speed m	ax		kt	s 120	km/h 2	22
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22								
23 Flight duration								
25 Dist. Airport - project area		0 km						

Two areas can be created:

- RangeProject Area containing all project information
- **RangeLines** Area containing all information on one flight line. For each flight line new rows are added and a table is created.



#### To add, delete or edit sections using Excel's Name Manager:

1. Click Formulas > and click Name Manager.

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3. Double-click a variable name to edit the respective section.

AutoSave 🛛	orr) 🚦																
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fx Sert Auto	Sum Rece	tly Financ	2 ial Logical	Text Date i	Q & Lookup & * Reference *	<b>B</b> Math & Trig *	More Functions +	Name	Ø Define !	iame xmula = om Selection	En Trac	e Precedents e Dependents	C Show Fe	ormulas ocking =	Watch Window	Calculation Options +	Calculat
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ums				_	4 minutes					Total photo	data		0 GB				
fotal flight dura	ation			#NAME?	minutes					Photo stora	ige usage		0 %				
fotal flight durs	ation			#NAME?	hours												
Strips																	
flown	flown		AMSL		HAGL [m]			nr of		GSD formal		length	time	minime	may GND	Baum at the	Rever t
Date	Aircraft	strip	(#)	min	mean	max	FWD%	image	s max	mean	min	[km]	[Min]	interv [sec]	speed [kts]	mins	mina
		_LineD	#NAME?	#NAME?	INAME?	#NAME?	#NAME?	_imgCou	ant #NAME?	INAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	0	0
0		1	-	INAME?	INAME?	#NAME?	#NAME?	0		#NAME?		FNAME?	#NAME?	#NAME?	-	0.0	0.0
Follow up																	
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Total mission tr Remaining miss	sion time			#NAME?	hours												

#### 12.3.1.3 Variables

The variable names are predefined. Each variable begins with an underscore (\_) so that it can easily be distinguished from other text in the document. Variables can either exist independently within a cell or be integrated into an equation.

Often, a project is planned using only the main sensor, despite the availability of other sensors, such additional NIR sensor(s).

These secondary sensors usually do not have the same properties as the main sensor. Key information about the secondary sensors can also be exported into an Excel template.



#### iX Plan 2024 Operation Guide 12. Exporting Projects

#### Adding additional sensors with own keywords:

1. In the Navigation bar, click 📑 Export.

- 2. Click Excel.
- 3. Under Sensor selection, select the required sensor information.
- 4. Information on the auxiliary sensors is provided by appending e.g. the suffix \_AUX1 to the keyword as shown below for the backward camera.

🔯 Export Project				– 🗆 ×
Excel Textfile	Excel export			
GPX	Template selection			
KML				
FrackAir	TEMPLATE_Vexcel_Ultracam_V	/2023.xlsx		~
abyrint X Flight Pro	See Excel keywords	Open templates folder	r	
2	_LineID =ROUND(CONVERT(_	AMSL_min,"m","ft"),-1)	=CONVERT(_HAGL_min,"m","ft")	=CONVERT(_HAGL_m
	Sensor selection			
	Sensor system	Main sensor	Auxiliary sensor	
	0C D - 20pts / 1078 si V	vertical	Backwalu	
			Forward	✓ _AUX2
			Left	✓ _AUX3
			LiDAR Scanner	✓ _AUX4
			(+)	
	D:\Documents\Downloads\Sam	pleProjects\240703_Drago	nExample\Export_UltraCam Drago	on.xlsx Set path

4. Click  $\bigoplus$  to add additional sensors of a sensor system.

#### Note

The main sensor does not require a suffix.



#### 12.3.1.4 Special cases

In order to compute a sum, mean, minimum or maximum value over all flight lines, the equations must reference the specific sections.

#### Examples:

Operation	German	English
Count	=ANZAHLA(INDEX(RangeLines;;1)	=COUNTA(INDEX(RangeLines;;1)
Min	=MIN(INDEX(RangeLines;;3)	=MIN(INDEX(RangeLines;;3)
Max	=MAX(INDEX(RangeLines;;4)	=MAX(INDEX(RangeLines;;4)
Average	=MITTELWERT(INDEX(RangeLines;;4)	=AVERAGE(INDEX(RangeLines;;4))
Sum	=SUMME(INDEX(RangeLines;;7)	=SUM(INDEX(RangeLines;;7)
. Sum		

The number at the end of the equation corresponds to the column of the section, e.g. column number 1 = 1.

#### 12.3.1.5 Saving the template

#### The template must be saved in the ProgramData folder:

%ProgramData%\PhaseOne\{{program version}}\Templates

#### 12.3.1.6 Variables List

Range: RangeProject	
General	
_SensorName	sensor name as displayed in iX Plan 2024
_SensorType	display name of the sensor type (Frame, Stepper, Pushbroom, SensorSystem, undefined)
_SenorBrand	brand of the sensor
_SensorModel	model of the sensor
_SensorLabel	sensor's display name within a sensor system (if it is not part of a system, the configuration name is displayed)
_ProjName	name of the project
_FOVWidth	sensor FOV (field of view) width [degrees]
_FOVHeight	sensor FOV (field of view) height [degrees]
_SpeedKn	airplane speed [knots]
_SpeedMs	airplane speed [m/s]
_SpeedKmh	speed [kmh]
_ConfigHAGLFt	flying height above ground level as defined in the sensor configuration [ft]
Frame	
_WidthPx	sensor width in pixel
_HeightPx	sensor height in pixel
_WidthMM	sensor width in mm
_HeightMM	sensor height in mm
_PixSize	pixel size in mm
_FocalMM	focal length in mm
_MaxFPS	maximum supported frame rate per second

Range: RangeLines		
General		:
_LineID	line ID	
_ParentLineID	flight line number (integer)	



General	
SegmentLineID	segment number of a flight line (integer)
_ 0	
	Noto
	Flight line cogments are not surrently supported by iX Flight Dro
_Sensor	sensor name
_SensorLabel	sensor label
_AMSL_min	minimum absolute altitude
_AMSL_max	maximum absolute altitude
_AMSL_mean	mean absolute altitude
_HAGL_min	minimum height above ground
_HAGL_max	maximum height above ground
_HAGL_mean	mean height above ground
_Start_X	starting point easting
_Start_Y	starting point northing
_End_X	end point easting
_End_Y	end point northing
_Start_Lon	starting point longitude
_Start_Lat	starting point latitude
_End_Lon	end point longitude
_End_Lat	end point latitude
_Length	length [map units]
_DistanceToNext	shortest distance to the next flight line [map units]
_DistanceToPrevious	shortest distance to the previous flight line [map units]
_SideOverlap_min	minimum side overlap
_SideOverlap_max	maximum side overlap
_SideOverlap_mean	mean side overlap
_Azimuth	azimuth [degrees]
_AzimuthBack	backward azimuth [degrees]
_Azimuth_WGS84	geographic azimuth [degrees]
_AzimuthBack_WGS84	geographic backward azimuth [degrees]
Frame Cameras	
_imgCount	number of images
_GSD_min	minimum ground sampling distance
_GSD_max	maximum ground sampling distance
_GSD_mean	mean ground sampling distance
_FWDOverlap_min	minimum forward overlap
_FWDOverlap_max	maximum forward overlap
_FWDOverlap_mean	mean forward overlap
_ImgBase_min	minimum base between image positions
_ImgBase_max	maximum base between image positions
_ImgBase_mean	mean base between image positions
	· · · · · · · · · · · · · · · · · · ·

# PHASEONE

# 12.4. Exporting data as KML

#### To export data to a KML file:

- 1. In the Navigation bar, click  $\square$  Export.
- 2. Click KML.
- 3. Select the required attribute checkboxes.
- 4. Change the path and file name, if necessary.
- 5. Configure the style options as required.
- 6. Click Export.

# 12.5. Printing a flight plan (PDFs)

#### Note

The templates are compatible with printing on various paper sizes. You can edit the format of PDF templates before printing by clicking **Edit** in the window that opens when selecting  $\square$  and **Print**. However, these settings are not saved in the file.

#### To adjust and save the template print size:

- 1. In the Navigation bar, click **Export**.
- 2. In the left sidebar, click **Print**.
- 3. Click Print.
- 4. At the top left of the window, click the Printer setup icon.
- 5. Adjust the page size and orientation as required.



6. At the top left window, click the **Print** icon.



# 12.6. Exporting data as text file

#### To export data to a text file:

- 1. In the Navigation bar, click  $\square$  Export.
- 2. Click Textfile.
- 3. Select the Flight lines and/or Image positions checkboxes as required.
- 4. In their respective panes, select the required flight line and/ or image position attributes.
- 5. Configure the Export settings (delimiter , header, output path/file name as required.
- 6. Click Export.



# 13. Troubleshooting

This section provides several troubleshooting tips as follows:

13.1. Logfile	85
13.2. Using log files	86

## 13.1. Logfile

The logfile displays debug messages that may assist you to troubleshoot problems.

The logfile appears automatically when an error or warning occurs.

Save Logfile Clear Log	file Loggin	g level	
Time	Log Type	Log Message	^
06.03.2024 15:11:12.894	Info	Updated Footprint of flight line 78-1	
06.03.2024 15:11:12.895	Info	Finished merging image footprints of flight line 78-1	
06.03.2024 15:11:13.167	Info	Current raster layer for cell inspection is TerrainImage	
06.03.2024 15:11:13.692	Info	DrawFightine called	
06.03.2024 15:11:23.017	Info	Current raster layer for cell inspection is TerrainImage	
06.03.2024 15:11:29.594	Info	Deleted line 78-1 (450668.438, 1375310.750, 2032.000 to 453749.063, 1370761.750, 2032.000)	
06.03.2024 15:12:01.038	Info	Creating 1 flight line(s)	
06.03.2024 15:12:01.040	Info	Creating Flightline 78-1	
06.03.2024 15:12:01.043	Info	Start Point: 453558.281, 1379709.375	
06.03.2024 15:12:01.045	Info	End Point: 453558.281, 1365190.250	
06.03.2024 15:12:01.047	Warning	Initial flightline too low, adding min. HAGL to max. terrain	
06.03.2024 15:12:01.049	Info	No rounding when using terrain following mode	
06.03.2024 15:12:01.063	Info	Calculating flight line altitude using terrain following mode with HAGL: 155.000 m	
06.03.2024 15:12:01.238	Warning	Forward overlap: Maximum iterations reached. 29 % instead of 30 % at image 11 of line 78-1 @Point[453558;1378467]	
06.03.2024 15:12:01.410	Warning	Forward overlap: Maximum iterations reached. 36 % instead of 30 % at image 27 of line 78-1 @Point[453558;1376498]	
06.03.2024 15:12:01.482	Warning	Forward overlap: Maximum iterations reached. 33 % instead of 30 % at image 29 of line 78-1 @Point[453558;1376231]	
06.03.2024 15:12:01.553	Warning	Forward overlap: Maximum iterations reached. 28 % instead of 30 % at image 30 of line 78-1 @Point[453558;1376123]	
06.03.2024 15:12:01.714	Warning	Forward overlap: Maximum iterations reached. 25 % instead of 30 % at image 42 of line 78-1 @Point[453558;1374760]	
06.03.2024 15:12:01.878	Warning	Forward overlap: Maximum iterations reached 21.9/ instead of 20.9/ at image 52 of line 78-1 @Point[453558;1373560]	=
06.03.2024 15:12:02.095	Warning	Forward overlap: Maximum iterations Locate in map t image 65 of line 78-1 @Point[453558;1372434]	
06.03.2024 15:12:02.179	Warning	Forward overlap: Maximum iterations reached. 27 % instead of 30 % at image 66 of line 78-1 @Point[453558;1372372]	
06.03.2024 15:12:02.330	Warning	Forward overlap: Maximum iterations reached. 40 % instead of 30 % at image 73 of line 78-1 @Point[453558;1371642]	
06.03.2024 15:12:02.420	Warning	Forward overlap: Maximum iterations reached. 11 % instead of 30 % at image 74 of line 78-1 @Point[453558;1371516]	
06.03.2024 15:12:02.529	Warning	Forward overlap: Maximum iterations reached. 31 % instead of 30 % at image 77 of line 78-1 @Point[453558;1371154]	
06.03.2024 15:12:02.676	Warning	Forward overlap: Maximum iterations reached. 42 % instead of 30 % at image 88 of line 78-1 @Point[453558;1369485]	
06.03.2024 15:12:02.877	Info	Final coordinates of flight line 78-1	
06.03.2024 15:12:02.878	Info	Start Point: 453558.281, 1379709.375	
06.03.2024 15:12:02.882	Info	End Point: 453558.281, 1365190.250	
06.03.2024 15:12:02.884	Info	Updated Footprint of flight line 78-1	
06.03.2024 15:12:02.886	Info	Finished merging image footprints of flight line 78-1	
1			, *
			·

### Note

For information on configuring log settings, see Section 10.1.1.3 - Logging

#### To display the logfile manually, perform either of the following:

- On your keyboard, press Ctrl + L.
- In the Navigation bar, click Settings and click Display Settings.
   Under Logging, click Open log window.



# 13.2. Using log files

#### To restore deleted flight lines:

- 1. Open the log file.
- 2. Right-click the log message containing the deleted flight lines.
- 3. Click Recreate flight line.

#### To use @Point or @Area messages:

- 1. Open the log.
- 2. Right-click the log message containing the @Point or @Area message.
- 3. Click the message Locate in map to locate the area or point in the map and/or zoom to it.

#### To save log files:

- 1. Open the log.
- 2. Click Save logfile.
- 3. Provide a path and filename for saving the log file.

