EOD Workspace Guide

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R60 (v2.4)

Version: 009

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Revision History

Revision	Initials	Date	Comments
001	CB	10.10.2018	Initial doc
002	CB	01.11.2019	Expanded section 4 Diagnostic View
003	CB	01.25.2019	Edits based on TG's feedback
004	CB	01.28.2019	Further feedback based on TG. Fixed Headers, changed image in 3.3 to make it clearer.
005	CB	09.06.2019	Updated Information for r60 (v2.4) ● Updated screenshots throughout document to reflect the new release ● Updated section 2.12 to reflect the inclusion of the Autopilots widget ○ Updated the widget to include new icons and step interface ● Updated section 5 to include Depth Fail Alarm ● Added section 6 to Included Xbox controller
006	CB	09.10.2019	Updated Controller Maps based on testing feedback.
007	CB	09.16.2019	Updated screenshots to reflect the changes in the control bar.
008	CB	09.17.2019	● Updated 2.8.7 To reflect Mission Selector connects to mission selector in the mission view tools menu. ● Updated 2.10.3 to include Screencast. ● Added 3.3.1 Referencing Step Size Controls.
009	TG, CB	09.25.2019	● Responded to feedback, significant restructuring of the document. ● Added cross references throughout the document ● Fixed Manip. Mode Image

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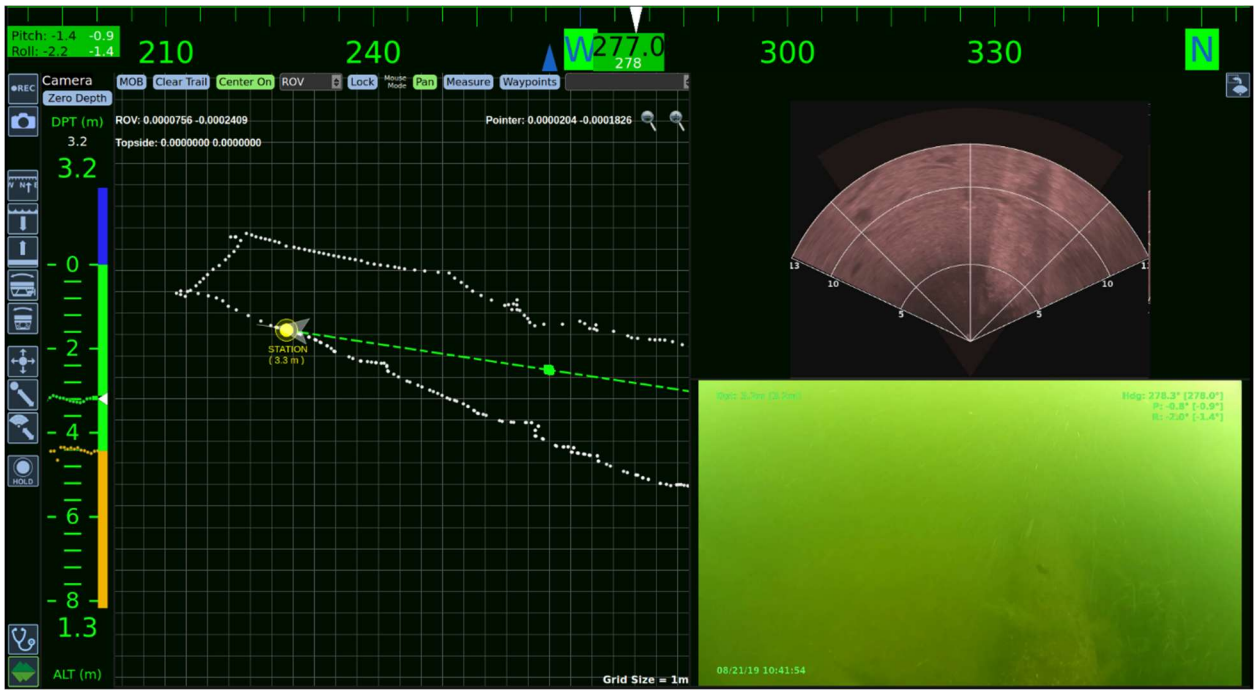
Greensea's EOD Workspace represents years of development resulting in a robust, user-oriented platform to complete mission objectives. Workspace allows operators to use a single screen interface to easily direct and maneuver your vehicle and quickly adapt to changing mission objectives. It is designed and able to be used on multiple devices and configurations.



1 What you Will Find in This Guide

This Guide is broken into five sections, Flight View, Dynamic Waypoint Positioning, Diagnostics View, and Alarms.

1.1 Flight View

Flight View is the operational side of Workspace, it is the primary view that you will be interacting with as you plan, conduct, and review missions. This section will describe the functions available in Flight View.

1.2 Dynamic Waypoint Positioning

Dynamic Waypoint Positioning describes the set of tools and features specific to vehicle control. This is one of the most fundamental concepts of operation within EOD Workspace. If you are trying to command the vehicle to go somewhere, this is where you should be looking.

1.3 Diagnostics View

The Diagnostics View is used to access the functions and systems of the vehicle. If you are trying to diagnose an issue with your sensors, this is the place to start.

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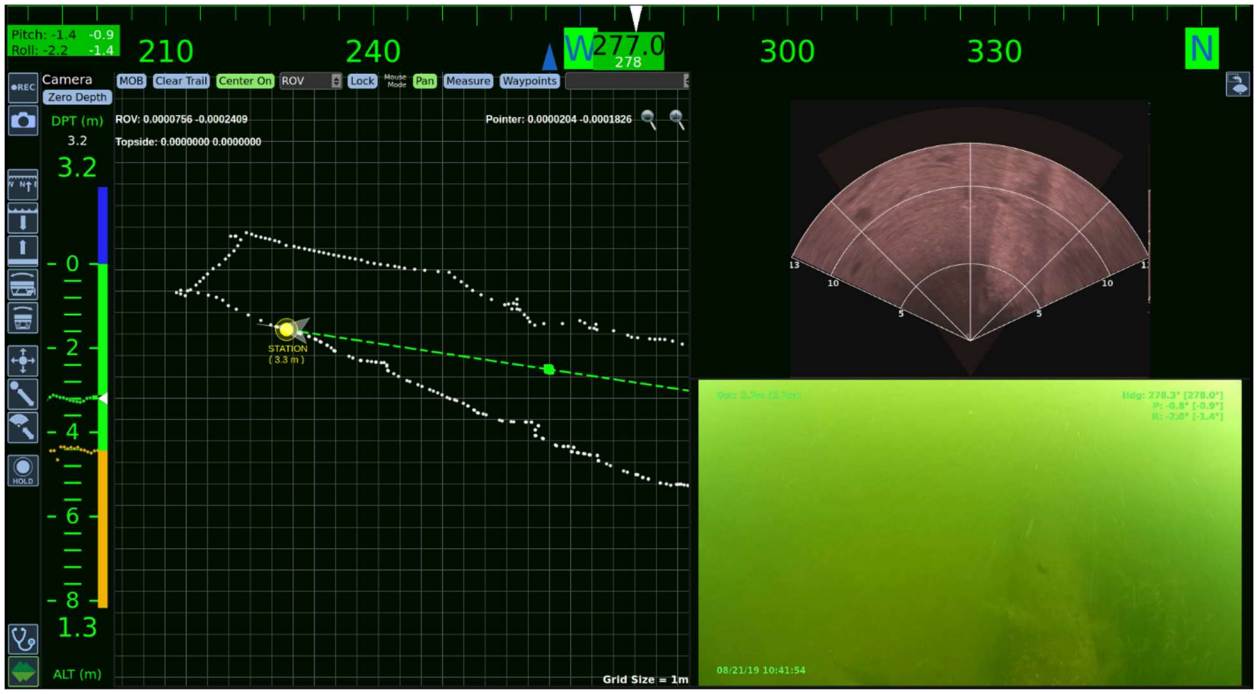
1.4 Alarms

Alarms are a visual alert that will trigger when specific criteria are met. These can be based around any signal, this can include things like the vehicle reaching a certain depth, or a loss of comms.

2 Flight View

Flight View is the primary view that you will use when using Workspace to perform tasks and completing operations. All navigational readouts and tools for directing the vehicle and planning missions are found in this view. Flight view is made up of individual widgets which will be discussed later in this section. Each of these widgets resized based on your need and preferences.



2.1 Toggling Flight View Layouts

You can quickly toggle between default views by using the F1 – F6 keys.

2.1.1 F1 Default View

The is the default view for Workspace and Flight View. Hitting the F1 key will return Flight View to this configuration.

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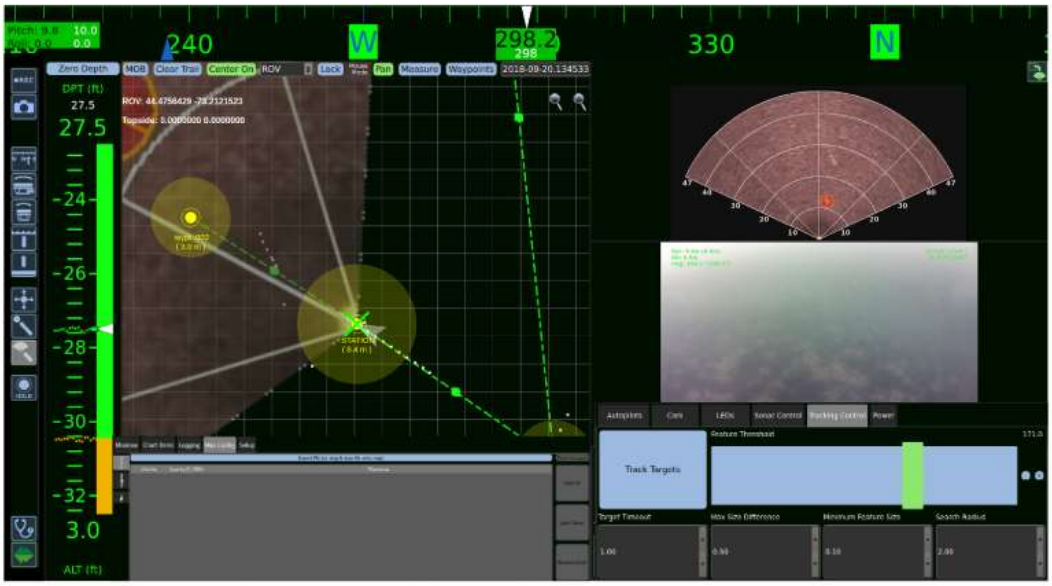
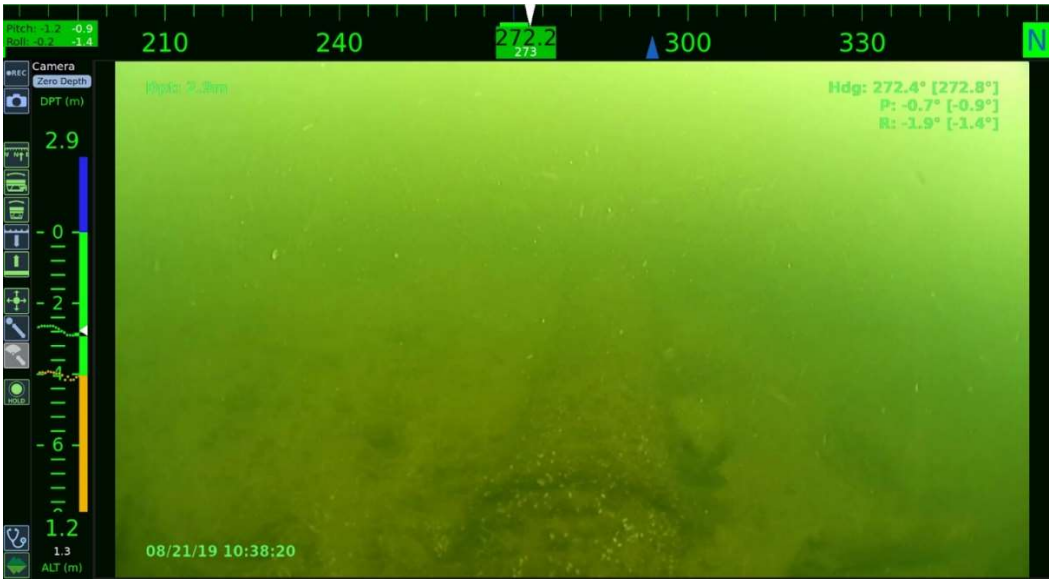


2.1.2 F2 Video View

Video view will minimize the map and sonar views to allow you to focus on the video feed from the video.



2.1.3 F3 Sonar View

Sonar View will minimize the map and video views to allow you to focus on the sonar feed.

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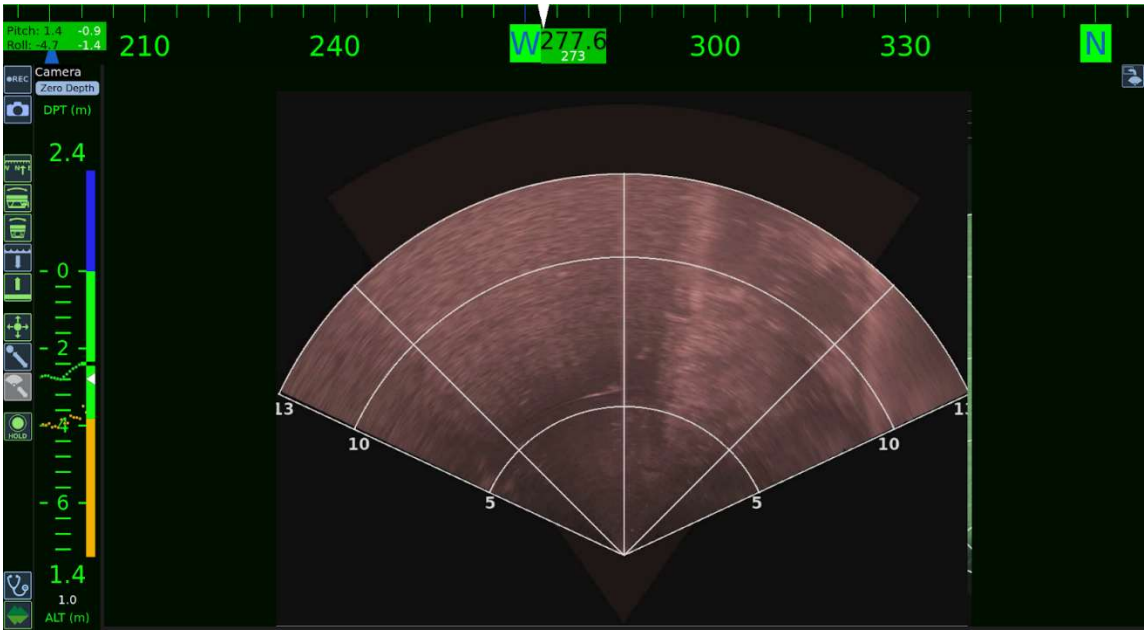
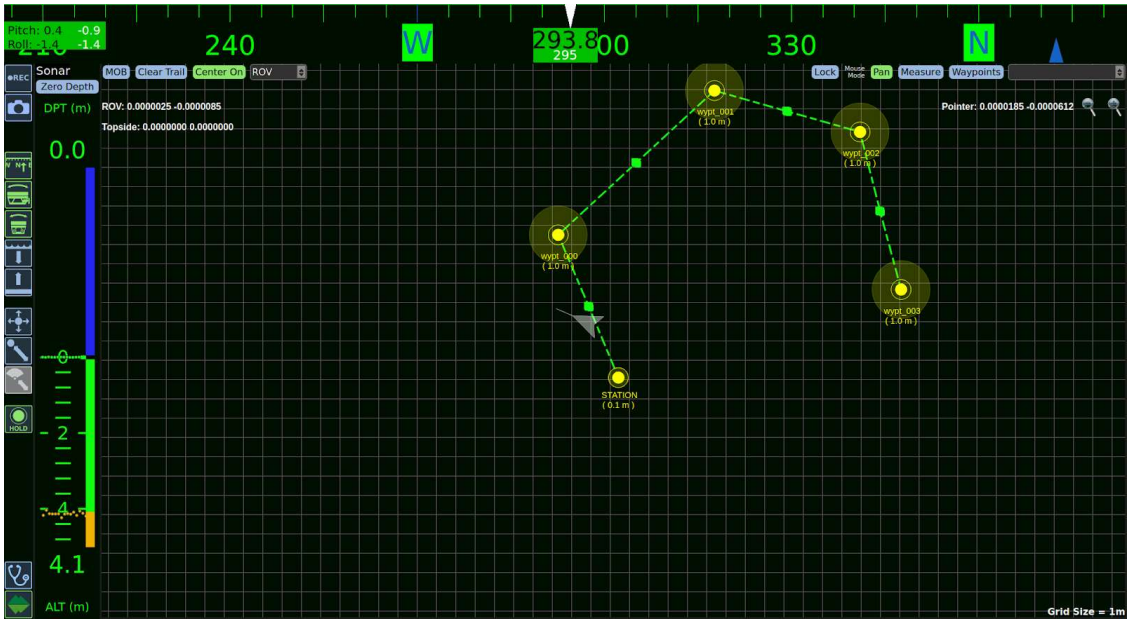


2.1.4 F4 Chart View

Chart view will minimize the video and sonar views to allow you to focus on the chart.



2.1.5 F5 Sonar and Video

Sonar and video view will minimize the chart view to allow you to focus on just the sonar and video feeds.

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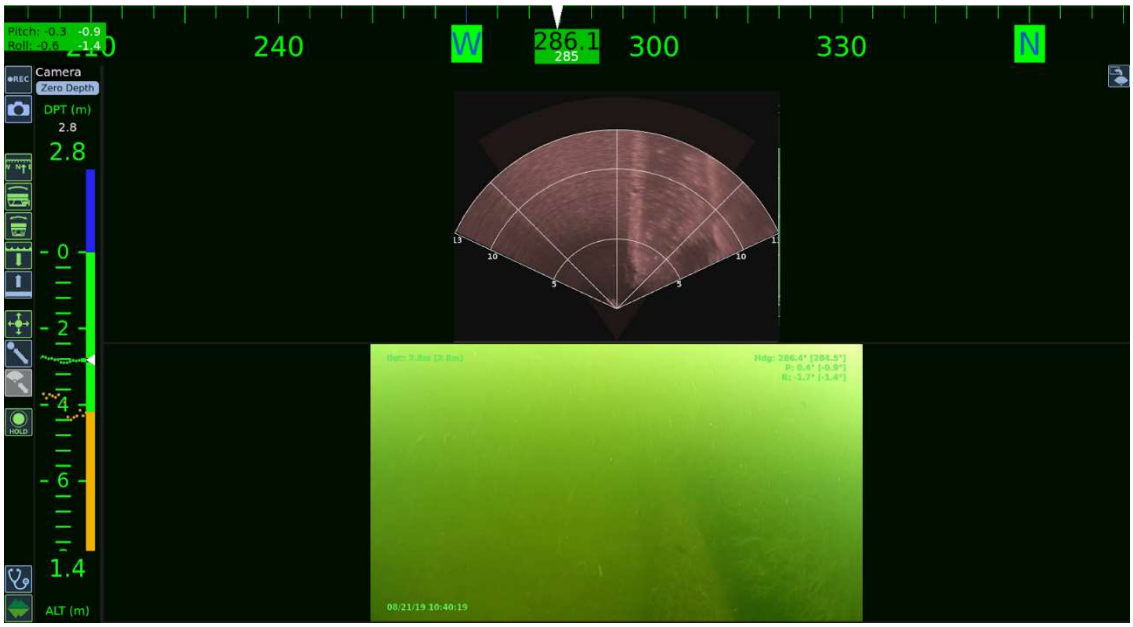
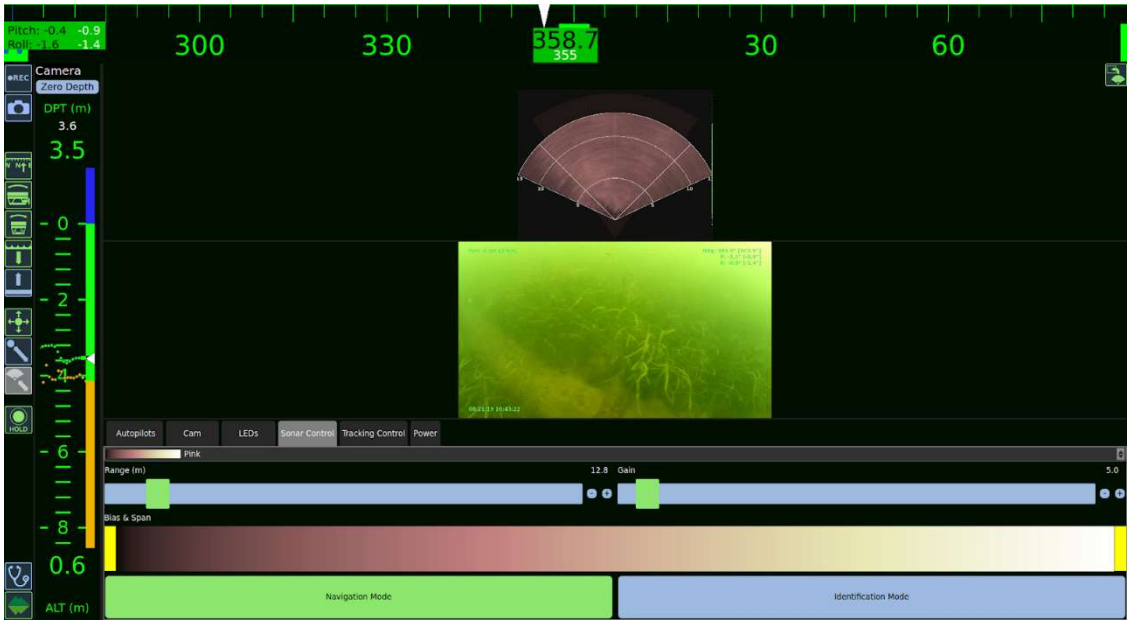


2.1.6 F6 Toggle Control Tabs

F6 toggles the control tabs that appear below the sonar and video widgets. Generally, the control tabs will only be visible if either the sonar or video widgets are visible.



2.2 Customizing Views

Flight View is made up of multiple individual widgets. The F1 – F6 keys automatically resize all widgets to specific presets. Each widget can be resized individually by hovering the edge of the widget with your cursor. When you do, the edge will highlight yellow. While highlighted, you can click and drag the edge to

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resize the individual widget to further customize your views. Hitting any of the F1 -F5 keys will resize all widgets to their default configurations.

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2.3 Compass Bar

The compass bar displays the vehicle pitch and roll, heading, course over ground, and any alarms that may be currently triggered.

2.3.1 Heading

The vehicle's current heading is shown in the green block at the center of the compass bar displayed in black. If auto-heading is enabled, the heading setpoint will be displayed using white text beneath the current heading. The setpoint is also known as the commanded heading.

Auto-heading Disabled

Auto-heading Enabled

2.3.1.1 Compass Markers

The compass bar may display two compass markers or "carrots". These markers will be shown depending on the orientation of the vehicle and if you are using auto-heading.

Heading Setpoint	The heading setpoint is also called the commanded heading. This is the point the vehicle is attempting to hold at. It is only visible if auto-heading is enabled. For information about enabling auto-heading can be found here 2.5 Control Bar.
Course Over Ground	This is the direction your vehicle is currently traveling and is independent of Heading. The Compass Bar prioritizes vehicle heading, so the Course Over Ground marker may not always be displayed. Instances where this might occur include if the vehicle is moving laterally or traveling backwards.

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2.3.2 Pitch and Roll

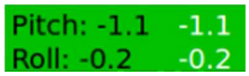
The vehicle's current pitch and roll is displayed in black text

- A zero value means the vehicle is level.
- Positive values mean
  - Pitch - The vehicle is pitched up.
  - Roll – The vehicle is rolling clockwise.
- Negative values mean:
  - Pitch – The vehicle is pitched down.
  - Roll – The vehicle is rolling counterclockwise.

If auto-pitch and roll is enabled, there will be a number in white to the right of the current pitch and roll. These are the pitch and roll setpoints. The vehicle will attempt to hold at these setpoints. To enable auto-pitch and auto-roll see 2.5 Control Bar

The pitch setpoint can be controlled from the hand or Xbox controller. For more information regarding Xbox controller inputs, see 6.1.3 Pitch & Roll Mode.

Auto-Pitch and Roll Disabled



Auto-Pitch and Roll Enabled

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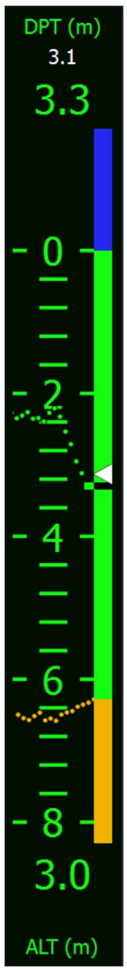
2.3.3 Alarms

Alarms will appear in the right of the Compass Bar. For more information about alarms, please see section 5 Alarms.



2.4 Depth and Altitude

The Depth and Altitude widget is used to track the depth and or altitude of the vehicle in the water column. These will be tracked in Meters or Feet depending on your settings, which are applied from the mission view tools (Map Config->Misc.).

For more information about the Misc. tab see section 2.12.5.2 Misc.

2.4.1 Depth

The vehicle's current depth is displayed at the top of the tracker. If auto-depth is enabled, the depth setpoint will be displayed as a white number above the current vehicle depth. The setpoint is the current commanded depth of the vehicle, the setpoint will be shown as a white marker on the depth and altitude bar.

For more information about enabling auto-depth, see section 2.5 Control Bar.

2.4.2 Altitude

The vehicle's current altitude is displayed at the bottom of the tracker. If auto-altitude is enabled, the altitude setpoint will be displayed as a white number below the current vehicle altitude. The setpoint is the current commanded location of the vehicle, the setpoint will be shown as a white marker on the visual tracking bar.

For more information about enabling auto-altitude, see section 2.5 Control Bar.

NOTE: DVL Bottom Lock is required for Auto Altitude to work.

2.4.3 Vehicle Setpoint

When the auto-depth or auto-altitude is enabled, the Depth and Altitude Bar The vehicle setpoint is shown by both a white number and white marker on the visual tracking bar. This is the commanded depth (or altitude) the vehicle will attempt to achieve and hold.

For more information about enabling auto-altitude and auto-depth, see section 2.5 Control Bar.

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2.4.4 Depth and Altitude Visual Tracking

The vehicle's current and recent vertical position is tracked by the green dots or breadcrumbs, the spacing of these dots can be used to show how fast or slow the vehicle is moving vertically. If you have achieved bottom lock with the Doppler Velocity Log (DVL) and are within sight of the bottom on the tracker, you will also see the bottom tracked with orange breadcrumbs.

The vehicle tracking meter bar displays three colors:

- Blue – This is the area above water.
- Green - The water column.
- Orange – The tracked location of the bottom.

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2.5 Control Bar

The Control Bar toggles navigation modes for the vehicle. These icons have three states: enabled, disabled, and inactive. Enabled icons will be green, disabled icons will be blue, inactive icons will be gray.

Icon	Name	Function
	Record	Toggles mission logging. When enabled, the icon will turn green, and **Logging** will appear at the top of the mission view.
	Screenshot	Clicking the icon will take a screenshot of the current Workspace View.
	Auto-heading	Toggles auto-heading. When you enable auto-heading, the system will create a setpoint at the current heading, the vehicle will maintain and follow the set point. While enabled, control inputs will move the heading setpoint. For information about auto-heading and the compass bar, see section 0 Compass Bar.
	Auto-depth	Toggles auto-depth. When you enable auto-depth, the system will create a setpoint at the current depth, the vehicle will maintain and follow the set point. While enabled, control inputs will move the setpoint. **NOTE:** Enabling auto-depth on will disable auto-altitude and vice versa. For more information about tracking auto-depth, see section 2.4 Depth and Altitude.
	Auto-altitude	Toggles auto-altitude. When you enable auto altitude, the system will create a setpoint at the current altitude, the vehicle will maintain and follow the set point. While enabled, control inputs will move the setpoint. **NOTE:** Toggling auto-altitude on will disable auto-depth and vice versa. For more information about tracking auto-altitude, see section 2.4 Depth and Altitude.
	Auto-Pitch	Toggles Auto-Pitch. When enabled, the system will create a setpoint at the current pitch, the vehicle will maintain and follow the set point. While enabled, control inputs will move the setpoint.
	Auto-Roll	Toggles Auto-Roll. When enabled, the system will create a setpoint at the current pitch, the vehicle will maintain and follow the set point. While enabled, control inputs will move the setpoint.
	Positioning	Toggles positioning. Enabling positioning will create an active waypoint at the vehicle's current location. While positioning is active control inputs will move the waypoint and the vehicle will follow it. Positioning is Described in depth in section 3 Dynamic Waypoint Positioning.
	Point of Interest	Toggles point of interest mode. Allows you to place a Point of Interest marker. When Enabled, vehicle control inputs will be oriented to the selected sonar target. For more information on point of interest mode see section 3.9 Point of Interest Control.
	Sonar Relative Control	Toggles sonar relative control. This icon is disabled unless you are using sonar target tracking. When Enabled, vehicle control inputs will be oriented to the selected sonar target.

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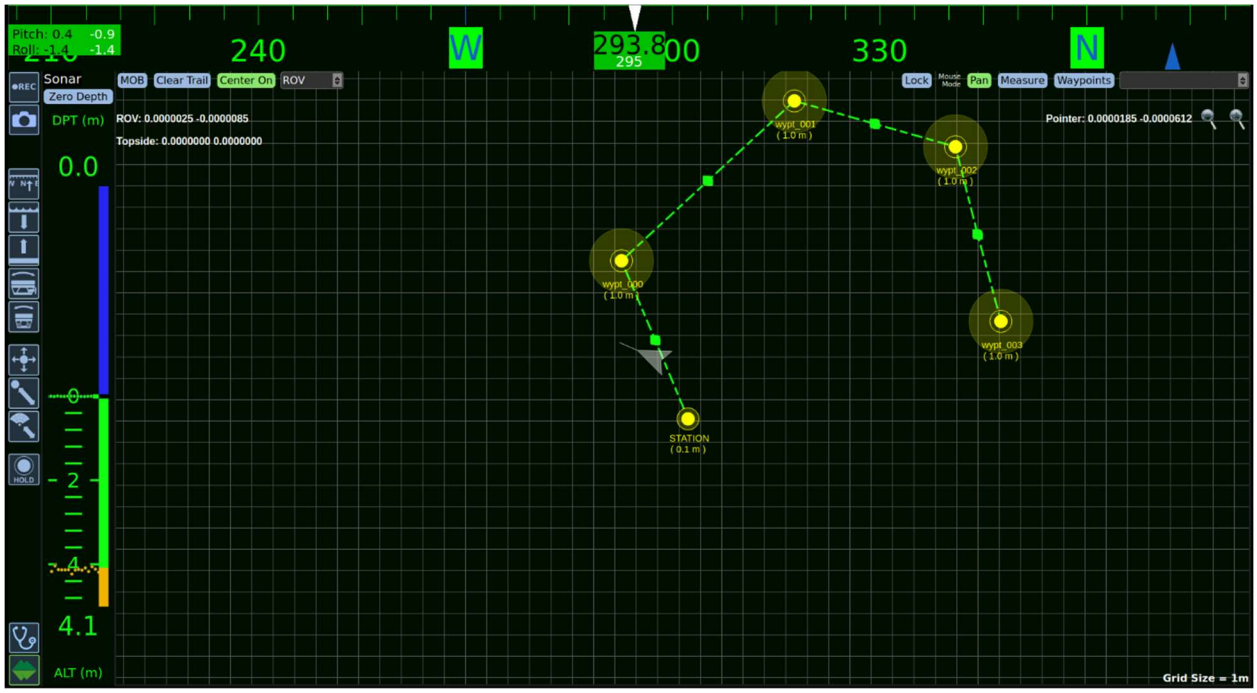
		For more information on Sonar Point of Interest see section 3.10 Sonar Relative Control.
	Hold	Toggles Hold. When enabled, and conducting a mission, the vehicle will stop and hold its position at the current active waypoint. When disabled, and conducting a mission, upon achieving an active waypoint the system will move the active waypoint to the next waypoint in the mission. When the vehicle achieves the last waypoint in a mission, the vehicle will continue to hold at the waypoint, but the Hold button will become inactive.
	Diagnostics View	Changes to the diagnostic view.
	Flight View	Changes to the Workspace View (which is the default view). This will be used for day-to-day vehicle operation.

2.6 Mission View



Mission View is a 2D top down display that shows vehicle, ship, and the vehicle's position, ship's position, beacons, and any charts loaded into the mission view. You can use the mission view to create navigational elements like markers and waypoints.

2.7 Heads-Up Display

The mission view heads-up display (HUD) is displayed across the four corners of the Map. It can be enabled or disabled from the Misc. tab within Map Config. For more information on editing the mission view overlay see section 2.12.5.2.1 HUD Text.

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The top-left HUD displays both the vehicle and topside location.

The top-right HUD displays the current coordinates of the cursor on mission view.

The bottom-left HUD displays the results of the last measurement taken with the Measure Tool. Once a measurement is taken, only the last taken measurement will be displayed.

For more information on the measure tool, see section 2.11.3 Measure.

The bottom-right HUD shows the current map scale.

2.8 Mission View Functions

2.8.1 Adjusting the Map Scale

You can click the magnifying glasses located next in the upper-right corner of the map to adjust the scale of the map. Alternatively, if you are hovering your cursor over the map, you can use the mouse scroll wheel to zoom in and out.

2.8.2 Waypoints

Waypoints are the fundamental control unit used to direct a vehicle in Workspace. Waypoints are used to station keep or used to create a mission. Waypoints are described more completely in section 3 Dynamic Waypoint Positioning.

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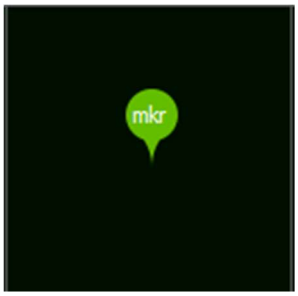
2.8.3 Markers



Markers are used to note specific locations on the map they are not part of a mission.

To add a marker to the map, right-click on the location you want to place a marker and select Add Marker from the pop-up.

Unselected markers are green, selected markers are cyan. You can adjust the position of markers by clicking and dragging them to the desired location on the map, or by manually setting editing their position parameters in the markers menu.

For more information on the markers menu, see section 2.12.3.1 Markers.

Markers and Waypoints can be locked by clicking the Lock button in the upper-right corner of the mission view.

2.8.3.1 Deleting a Marker

To delete a marker, right-click a marker and select Delete from the pop-up menu. Alternatively, select the marker from the list in the Markers subtab and click the red X in the Delete column.

2.9 Mission View Pop-Up Menus

By right-clicking locations and objects in the mission view, you can open a menu of options allowing you to quickly interact with items in and on the mission view.

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2.9.1 Map Pop-Up Menu

By right-clicking an open area on the mission view, a general pop-up menu with the following selections.

Menu Item	Description
Add and Go To Waypoint	Creates a new waypoint and commands the vehicle to travel to the selected location. This Waypoint will be part of a new mission. The vehicle will only begin traveling to this waypoint if Positioning is enabled. See Positioning in section 2.5 Control Bar.
Add Waypoint	Creates a Waypoint at the selected location. This Waypoint will be added to the currently selected mission.
Add Marker	Creates a marker at the selected location.
Set Point of Interest	Sets a point of interest and enables Point of Interest Mode. For more information on Point of Interest Mode see section 3.9 Point of Interest Control.
Copy Position	Copies the latitude and longitude location of the cursor.
Set Position	Sets the vehicle position in mission view to the location of the cursor. **CAUTION:** If Positioning is active and you set the vehicle position to a new location, the vehicle will attempt to return to its current waypoint.

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2.9.2 Waypoint Pop-Up Menu

Right-clicking a Waypoint, within the tolerance, will open a waypoint specific pop-up menu with the following options. This can be difficult if the if

Option	Description
Edit Waypoint...	Opens the Waypoint Editing Window to edit waypoint details. For more information about editing waypoints see section 3.7 Editing Waypoint Details.
Go to Waypoint	Commands the vehicle to go to the selected Waypoint. This will change the current mission to the mission that includes the selected Waypoint.
Set Point of Interest	Sets a point of interest and enables Point of Interest Mode. Vehicle controls will be oriented towards the Point of Interest.
Edit Mission...	Opens the Edit Mission Window for the selected Mission.
Execute Mission	Commands the vehicle to execute the selected mission starting with the first waypoint. **NOTE:** If reverse is enabled in the autopilot jog window the vehicle will go to the last waypoint in the mission.
Add to Mission...	Opens a dialogue to add the selected Waypoint to a mission.
Lock/Unlock Waypoint	Toggles locking of the selected Waypoint. If lock is enabled, it disables click-and-drag for the waypoint, preventing the waypoint from accidentally being moved. To lock all waypoints at once, see section 2.10.5 Lock.
Hide/Show Waypoint Tolerance	Toggles the display of the current waypoint tolerance radius. For information on waypoint tolerance, see section 3.1 The Waypoint.
Delete Waypoint	Deletes the selected Waypoint.

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2.9.4 Mission Pop-Up Menu

The Mission Pop-Up Menu is accessed by right-clicking the blocks connecting Waypoints.

Option	Description
Edit Mission...	Opens the Edit Mission Window for the selected Mission.
Add to Mission...	Opens a dialogue to add the selected mission to another mission.
Remove Mission	Deletes the selected Mission.
Execute Mission	Commands the vehicle to execute the selected mission starting with the first waypoint.

2.9.5 Region Pop-Up Menu

Additional Options are added when you right-click on a region on the mission view.

Option	Description
Set Coverage	Opens the Region Coverage Window. From this window, you can create a mission to cover the defined region. Setting coverage removes any previously created mission for the selected region. For more information about region coverage see section 3.11 Waypoints and Regions.
Clear Coverage	Deletes the mission created for this Region.
Execute Mission	Commands the vehicle to execute the mission associated with the Region.
Toggle Exclusion Zone	Toggles the region to become an Exclusion Zone. This is a visual reminder to avoid an area. **NOTE:** An exclusion zone is a visual reminder only and will not prevent the vehicle from region the area if commanded. **NOTE:** If a mission is associated with the Region, this will delete the mission.
Unlock Region	Unlocks the region. When unlocked, you can click and drag the region reference point to move the region or click and drag the other vertices of the region to reshape it.

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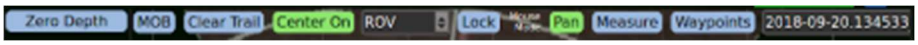
2.9.6 Marker Pop-Up Menu

Right-clicking a marker opens a pop-up menu with the following options.

Option	Description
Go to Marker	Commands the vehicle to go to the selected marker.
Delete Marker	Deletes the selected marker.
Show/Hide Safety Zone	Toggles the display of the safety zone surrounding the Marker. A Safety Zone is a visual indicator on the mission view noting an area to be cautious of. NOTE: The Safety Zone is a visual reminder only and will not prevent the vehicle from entering the area if commanded.

2.10 Map Controls

The top of the mission view includes several controls, their function is described below.



2.10.1 Zero Depth

Located above the Depth and Altitude gauge. This will reset the depth to zero. This is usually done before the start of a mission to allow for altitude differences.

CAUTION: Do not zero depth while the vehicle is submerged. Doing this may cause irregular vehicle movement.

2.10.2 MOB (Man Overboard)

Man Overboard (MOB) is a specialized marker that saves vehicle position, attitude, and time of creation.

To create a MOB marker, click the MOB button in the top-left corner of the mission view.

Unlike standard markers, the MOB records instantaneous vehicle attitude and position when the button is pressed. The man overboard marker appears as a green triangle beneath the vehicle with the triangle pointing in the direction of the vehicle heading when the MOB was created.

MOB marker information is found in the Man Overboard tab under Chart Items in the Mission View Tools.

If Display Range/Bearing is enabled from the MOB tab on the navigation menu, it will display in the upper-left corner of the mission view.

MOB markers are saved with mission information. For more information regarding saving mission data see section 2.12.1.3.4 Save.

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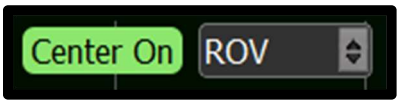
2.10.3 Clear Trail

Clicking this button will clear the vehicle breadcrumb trails in mission view.

2.10.4 Center On



When enabled (highlighted green), Center On will keep the Map focused on the item selected from the dropdown to the right of the center on button, in the case of the example to the right, mission view will be focused on the ROV. The mission view will continue to snap the ROV to the center of mission view whenever it moves off the visible area, or you move the map away from the ROV.

There are two center modes True and Bounded. These are described in section 2.12.5.2.4.2 Center on Mode.

2.10.5 Lock

Locks all waypoints and markers so they cannot be accidentally move by the mouse. When a lock is active, the Lock Button will be colored green. Waypoints can be individually locked and unlocked.

For information on locking individual waypoints, see section 0

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Waypoint Pop-Up Menu.

2.10.6 Mission Selector

Found in the upper right corner of mission view. The mission selector dropdown allows you to select an already created mission or to create a new mission.

For more information on mission creation, see section 3.4 Creating a Mission Using Multiple Waypoints.

2.11 Mission View Modes

There are three modes available in mission view: pan, measure, and waypoints. Each mode changes how a left click will work in mission view.

2.11.1 Pan

Selecting the Pan mode allows you to click and drag the mouse to move the map.

NOTE: If you have Center On True enabled, you will be unable to move the map. If you are using Center On Bounded, the mission view will snap back to the object you are centered on if you move that point outside of the bounded area.

For more information about Center On, see section 2.10.4 Center On.

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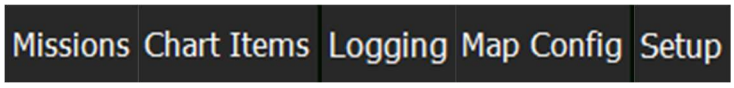
2.11.3 Measure

The measure mode allows you to click and drag the mouse to measure the distance and bearing between the point clicked and the point the mouse was released. After measuring, the coordinates of the two points will display in the bottom left corner of the mission view, the distance between and bearing between the two points will appear at the termination of the measurement. These will remain on screen until the map is clicked again.

2.11.4 Waypoints

The waypoints mode toggles the ability to left click the map to add waypoints. When enabled, left clicking will add a wayppoint to the currently selected mission.

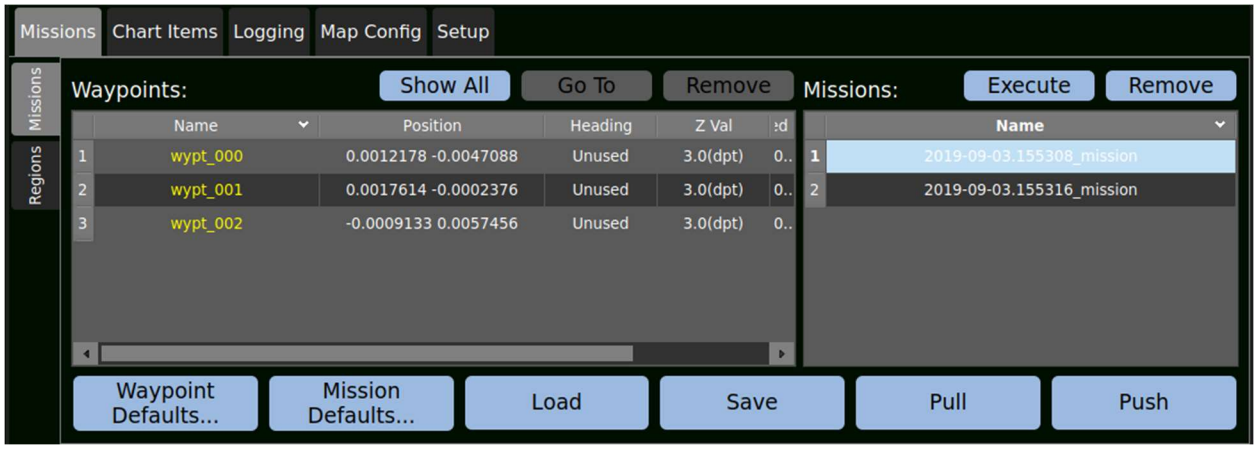
2.12 Mission View Tools



The mission view tools menu is located at the bottom of the mission view and is usually hidden. It can be accessed by either hovering over the bottom of the mission view, or by using the drag handle at the bottom of mission view. It is made up of five main tabs: Missions, Chart Items, Logging, Map Config, and Setup.

2.12.1 Missions Tab

You can interact with waypoints and missions directly using the mission view. However, you are also able to interact with waypoints and missions from the Missions Tab.



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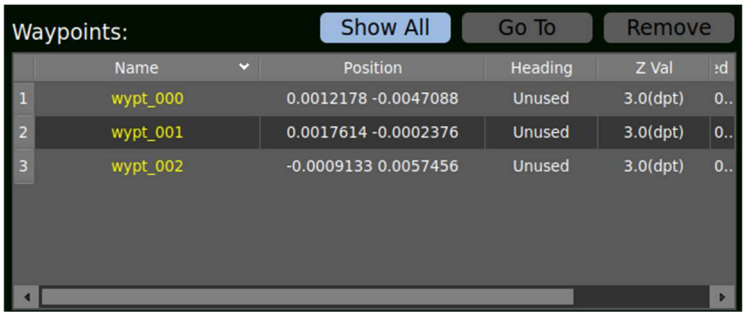
2.12.1.2 Missions Subtab

2.12.1.2.1 Waypoints Area

The Waypoints list typically only shows the waypoints that are part of the mission selected from the mission list to the right. You can select a specific waypoint from the list or double click it to open the edit waypoint window. You are also able to ctrl+click or shift+click to select multiple waypoints from the list.



2.12.1.2.1.1 Show All

The Show all button will display all waypoints currently created in the mission view

2.12.1.2.1.2 Go To

The Go To button commands the vehicle to go to the waypoint selected from the Waypoint List. This button does not respond to Waypoints selected from the mission view.

NOTE: The vehicle must first be in positioning mode to begin traveling to the waypoint.

2.12.1.2.1.3 Remove Waypoint

Removes the currently selected waypoint from the waypoint list and from the mission view. This button does not respond to Waypoints selected from the mission view.

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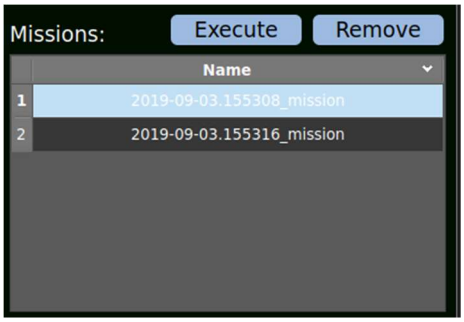
2.12.1.2.2 Missions Area

2.12.1.2.2.1 Execute Mission



The execute mission button commands the vehicle to execute the currently selected mission beginning at the first waypoint.

For more information about mission execution, see 3.4 Creating a Mission Using Multiple Waypoints.

2.12.1.2.2.2 Remove Mission

Deletes the mission selected from the Missions List.

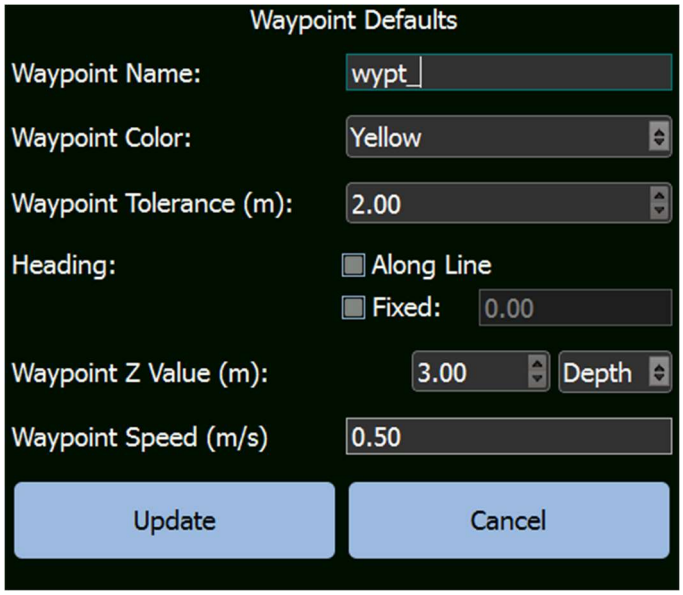
Removing a mission does not require confirmation, if not previously saved the mission will be lost.

For more information on saving a mission, see section 2.12.1.3.4 Save.

2.12.1.3 Mission Tab Buttons

2.12.1.3.1 Waypoint Defaults...

The waypoint defaults button opens the Waypoint Defaults window. From here you can edit the default values for future waypoints created in Workspace.



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Waypoint Name	Sets the default prefix for waypoints.
Waypoint Color	Allows you to pick the default color for waypoints.
Waypoint Tolerance	Sets the default tolerance for waypoints. For more information on waypoint tolerance, see section 3.1 The Waypoint. . **NOTE:** A small tolerance may make it very difficult for the ROV to achieve and expends more energy and time.
Heading	You can use the heading option to define the default vehicle heading as it travels towards a waypoint. If no option is selected, and auto-heading is enabled, the vehicle set it's heading to point towards the Waypoint. along line means that, in a multi-waypoint mission, the vehicle will set its heading to match that of the line connecting waypoints. Using the Fixed option, you can define a specific absolute heading that the vehicle will maintain while traveling to waypoints.
Waypoint Z Value	Using the Z Value, you can define the default vertical component for a waypoint if using auto-depth. You can define this verticality as either depth (measured from the surface) or altitude (measured from the floor). The tolerance will be considered for the Z value in terms of achieving a waypoint. waypoint tolerance.
Waypoint Speed	The default speed the vehicle will use as it travels to a waypoint.

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2.12.1.3.2 Push

NOTE: This functionality is disabled in EOD Workspace.

2.12.1.3.3 Pull

NOTE: This functionality is disabled in EOD Workspace.

2.12.1.3.4 Save

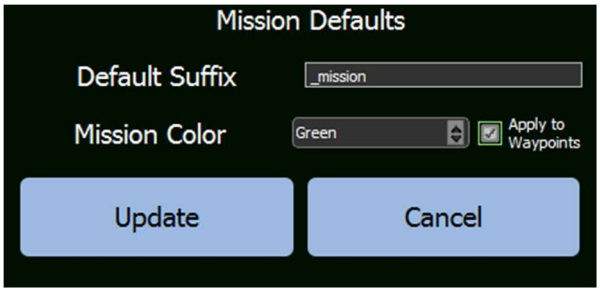
Saves all waypoints, missions, and markers to a .YML file.

2.12.1.3.5 Load

Loads previously saved waypoints, missions, and markers from a .YML file

2.12.1.3.6 Mission Defaults...

Opens the Mission Defaults Menu, allowing you to edit the default Mission Color and name suffix. This will apply to all future missions.



2.12.1.4 Regions Subtab

You can use the Regions subtab to create and edit regions on the map. Regions are defined areas of the map that can be used to automatically create missions covering the created region

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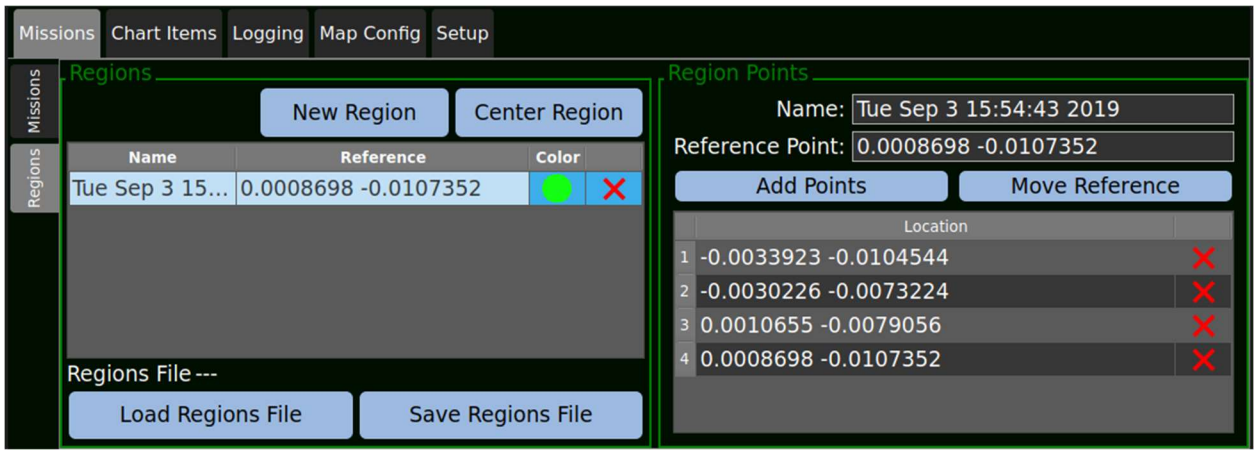
2.12.1.4.2 Regions

Displays a list of all created regions.



Button	Function
New Region	Starts creation of a new region. 2.12.2 For more information about creating a region, see 3.11.2 Creating a Region .
Center Region	Centers the map on the datum for the region selected from the region list.
Load Regions File	Loads a previously saved region.
Save Regions File	Saves all regions into a YML file.

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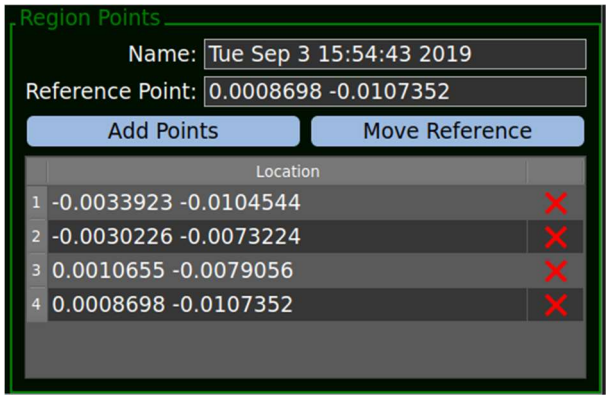
2.12.2.1.2 Region Points

From the region points area you can see a list of individual points making up the selected region. To interact with the Region Points area, you need to first select a region from the regions list to the left.



Button	Function
Add Points	Toggles point adding mode. While the add points button is enabled (green) clicking on the map will add an additional point to define the region.
Move Reference	When move reference is enabled, clicking the map will move the defined region datum to the location when you click the map.

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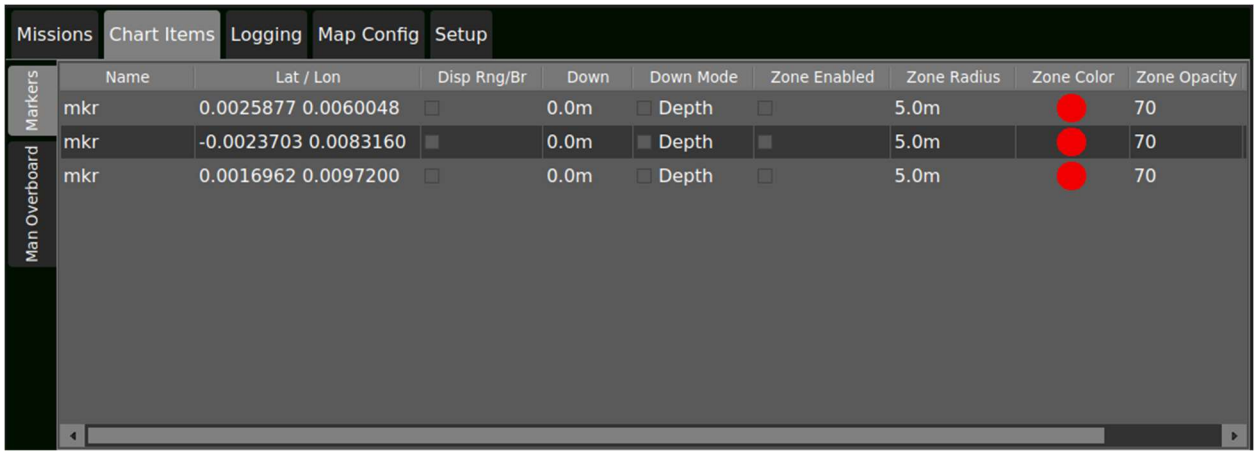
2.12.3 Chart Items Tab

The Chart Items tab allows you to interact with markers appearing on the mission view.

2.12.3.1 Markers Subtab

Lists all created markers. Marker properties can be edited by double-clicking the fields in the table shown below.



Field	Description
Name	The name given to a specific marker.
Lat/Lon	The marker's position. This column will change depending on the chosen displayed units selected from the mission view menu. For information on how to change your displayed units, see section 2.12.5.2.3 Displayed Units.
Disp Rng/Br	Shows or hides the range and bearing of a selected marker in the top left HUD.
Down	The vertical position of the marker. This is either measured from the surface or the bottom as dictated by the Down Mode.
Down Mode	Toggles how the marker's depth is referenced (from the surface or from the bottom). The field displays the current down mode. Depth measures from the surface, Altitude measures from the bottom.
Zone Enabled	Enables or disables a Safety Zone displayed the marker.
Zone Radius	Sets a Safety Zone radius around the marker.
Zone Color	The color of the Safety Zone around the marker. The color can be changed by double-clicking on the circle and selecting a new color from the menu that appears.

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Zone Opacity	Changes the shading of a Safety Zone. A higher zone opacity will result in a more darkly shaded zone. This can be changed by double-clicking the zone opacity field, pressing the up and down arrows, or manually entering the desired value.
Delete	Removes a marker from the map by clicking the red 'X' in the delete field.

2.12.3.2 Man Overboard Subtab

Lists all man overboard (MOB) markers. Each MOB property can be edited by double-clicking the field in the table shown below.

Field	Description
Name	The default for a MOB marker is mob.
Lat/Lon	The vehicle's position when the MOB button was clicked. This column will change depending on the chosen displayed units selected from the mission view menu. For information on how to change your displayed units, see section 2.12.5.2.3 Displayed Units.
Disp Rng/Br	Enables or disables the Range and Bearing of the MOB marker in relation to the vehicle in the top left HUD.
Down	The depth of the vehicle.
Roll	The roll of the vehicle when the MOB button was clicked.
Pitch	The vehicle's pitch when the MOB button was clicked.
Heading	The heading of the vehicle when the MOB button was clicked.
Created	The system time when the MOB button was clicked.
Delete	Removes the MOB from the map by clicking the red 'X' in the delete field.

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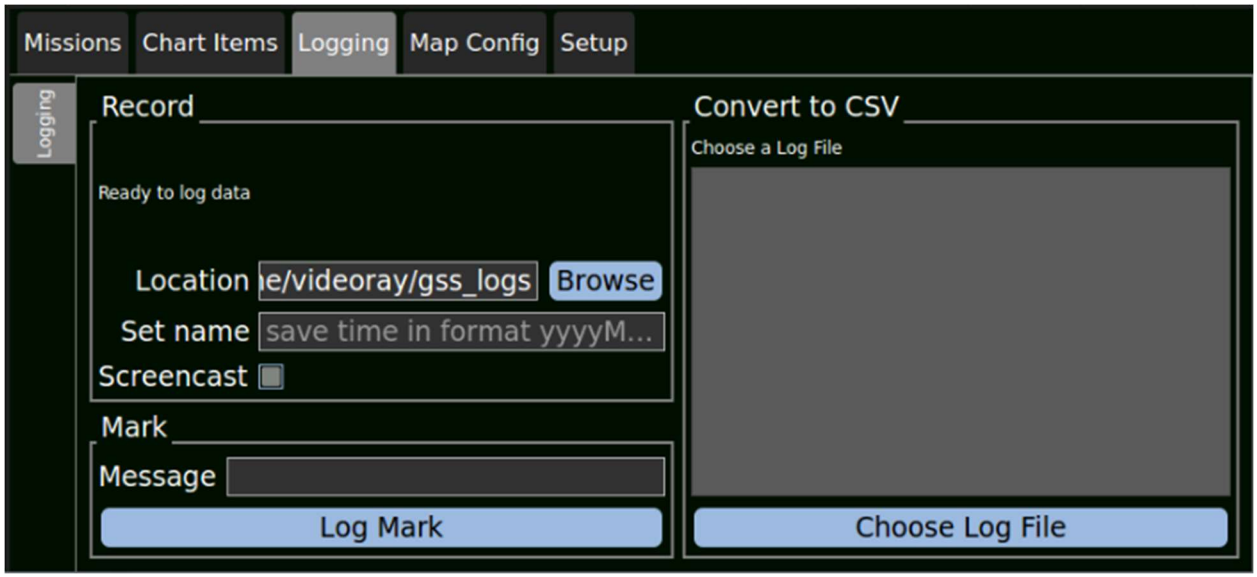
2.12.4 Logging Tab

2.12.4.1 Logging Subtab



NOTE: Logging can be started by using the Rec Icon found on the Control Bar or the controller.

2.12.4.1.1 Record Area

From the record area you can edit where the log data will be stored and the name of the log files. The log will be saved in the location dictated by the Location field. Screencast

When the screencast checkbox is checked, Workspace will create a third MP4 file when taking a log. This MP4 is a video log of Workspace as it was being used by the operator.

NOTE: You may notice a visual slowdown when recording a screencast.

2.12.4.1.2 Mark

Clicking the Mark button creates a mark in the playback. This can be used to note an event that has occurred during an in-process recording.

2.12.4.1.3 Convert to CSV

Opens a file viewer to select a log file to be converted to a CSV file.

To create a CSV from a log file:

1. Browse for a file ending with TELEMETRY.GSSBIN.
2. Select the Channel to convert from the Convert to CSV list.
   (You can shift+click or ctrl+click to select multiple channels)
3. Click the Convert to CSV button (the text of the Choose Log File button will change to this)

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2.12.4.2 Playback Subtab

The playback subtab is only available from Playback Workspace. You can launch the Playback Workspace from the desktop. Playback Workspace is visually the same as EDO Workspace but has its ability to send commands to the vehicle disabled. You will find playback controls in Playback Workspace the mission view menu under the Logging tab and the Playback subtab.

2.12.4.2.1 Browse

Opens a file browser to select a log file to playback in Workspace.

2.12.4.2.2 Clear

Clears the currently selected log from Workspace.

2.12.4.2.3 Play

Begins playback of the selected log file.

2.12.4.2.4 Step

The Step button advances the playback by one LCM message and pauses the playback.

2.12.4.2.5 Loop

Loop toggles looping for the log. When loop is enabled, and the log reaches the end, it will repeat from the beginning.

2.12.4.2.6 Speed Selector

Allows you to adjust the speed at which the log plays back.

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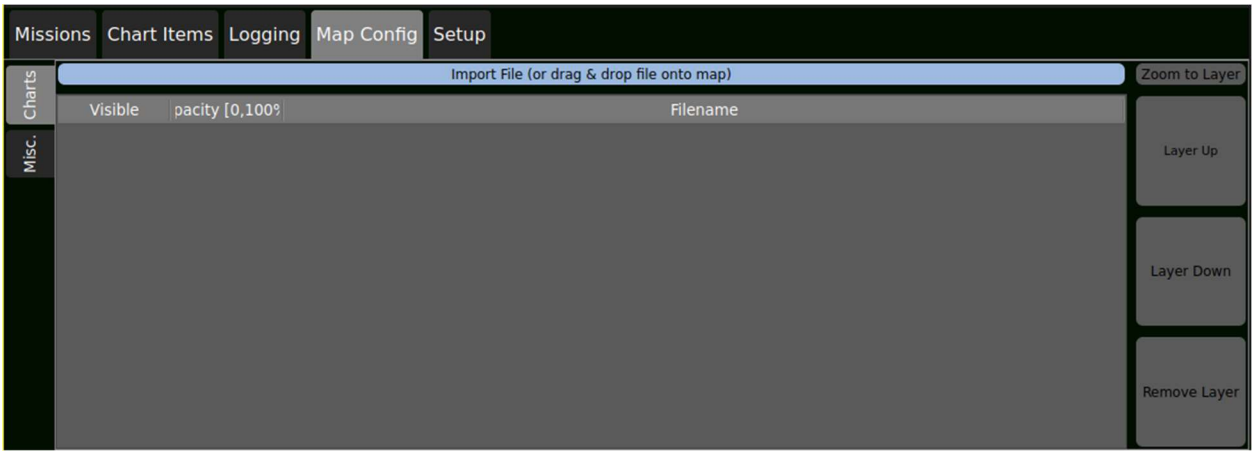
2.12.5 Map Config Tab

The Map Config tab allows you to edit the information displayed on the map.

2.12.5.1 Charts Subtab

The Charts Subtab allows you to add, edit the visibility of, and move the chart layers in the mission view.



2.12.5.1.1 Chart Visibility

From the visible column, you can toggle whether a chart is displayed. The checkbox indicates that the chart is currently visible, if unchecked, the chart will be hidden.

2.12.5.1.2 Chart Opacity

The opacity field allows you to adjust the opacity of the selected chart layer. By double-clicking the field, you can adjust the opacity of the selected chart.

2.12.5.1.3 Zoom to Layer

The Zoom to Layer button moves and adjusts the focus of mission view to center on and fit the entirety of the selected chart in the view.

2.12.5.1.4 Layer Up / Layer Down

The Layer Up and Layer Down buttons move the selected chart up or down in the chart stack.

2.12.5.1.5 Remove Layer

Deletes the selected chart layer from the mission view and this list.

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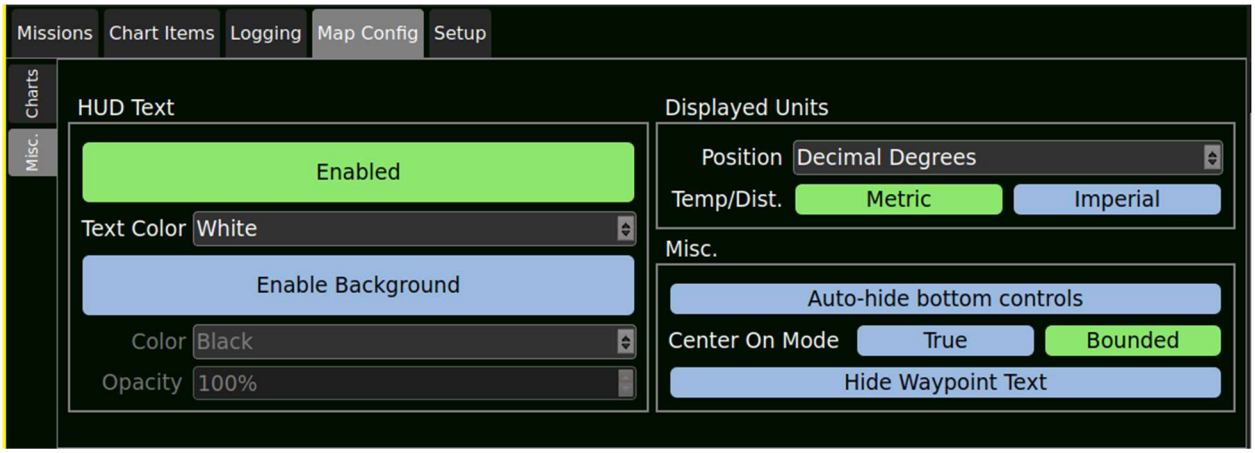
2.12.5.2 Misc. Subtab

The Misc. Subtab allows you to configure the Heads-Up Display, displayed units and other miscellaneous options.



2.12.5.2.1 HUD Text

The HUD text enables or disables the text overlay on the mission view. You can also select the text color.

2.12.5.2.2 Enable Background

You can use enable background to toggle background for the HUD Text. If enabled, you can select the background color and opacity of the text background. This can enhance the HUD text visibility

2.12.5.2.3 Displayed Units

Position can be displayed in Decimal Degrees; Degrees, Minutes, Seconds; Degrees, Decimal Minutes; and UTM. As well, you can choose between Imperial and Metric units for Temperature and Distance.

2.12.5.2.4 Misc.

2.12.5.2.4.1 Auto-hide bottom controls

Auto-hide bottom controls will toggle the mission view tools menu to be hidden by default. Once hidden, the menu can be accessed by moving your mouse cursor on the bottom of the mission view.

2.12.5.2.4.2 Center on Mode

Dictates the Center On style used in mission view. This can be either True or Bounded.

For information on Center On, see section 2.10.4 Center On.

2.12.5.2.4.2.1 Center on Mode True

Center Mode True keeps the selected vehicle in the center of the map when Center On is enabled.

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2.12.5.2.4.2.2 Center on Mode Bounded

Center on Mode Bounded will always keep the vehicle within mission view when Center On is enabled. If the vehicle is moved outside of the displayed area, the map will snap back to displaying the vehicle in the center of the frame.

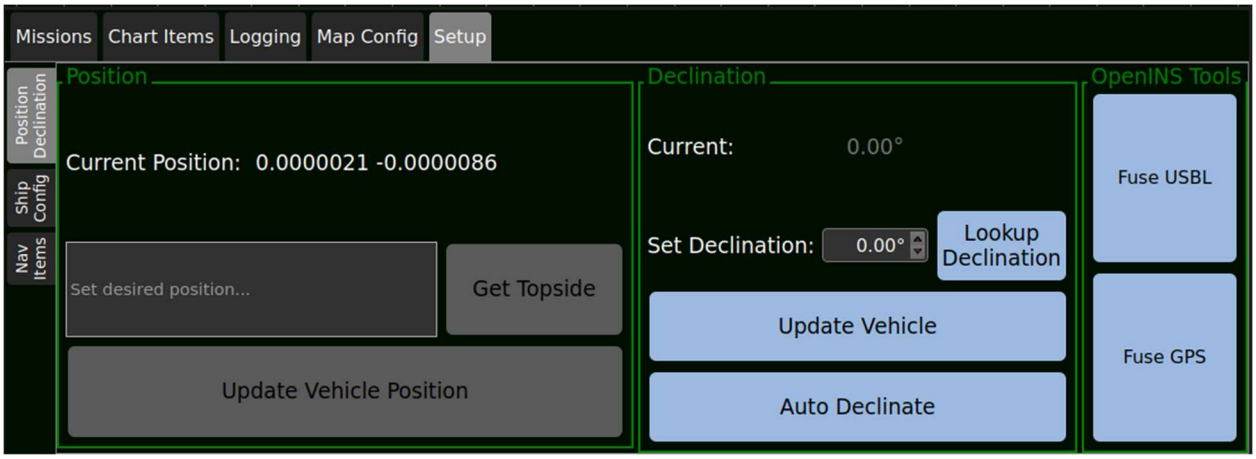
2.12.5.2.4.3 Hide Waypoint Text

Hides the Waypoint text in mission view.

2.12.6 Setup Tab

2.12.6.1 Position Declination Subtab

From the position declination subtab, you can manage and edit vehicle position, declination, and adjust which sensors are included in the navigation solution.



2.12.6.1.1 Position Area

The position area can be used to manually update the position of the vehicle.

2.12.6.1.1.1 Current Position

The current reported position of the vehicle. Set Desired Position…

From the set desired position textbox, you can manually enter a new vehicle position. To update the current vehicle position to the desired position, click the Update Vehicle Position button.

2.12.6.1.1.2 Get Topside

You can use the Get Topside button to auto-fill the position textbox with the current topside position.

2.12.6.1.1.3 Update Vehicle Position Button

Updates the current position to the position in the Set Desired Position textbox.

2.12.6.1.2 Declination Area

From the declination area you can see and update the vehicle declination.

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2.12.6.1.2.1 Current Declination

The current reported declination of the vehicle.

2.12.6.1.2.2 Set Declination field

The set Declination field allows you to enter a new declination for the vehicle. To update the current declination, enter a new declination into the field and click the Update Vehicle button.

2.12.6.1.2.3 Auto Declination

The Auto Declination toggles Auto Declination Detection; when enabled, the widget will listen for a valid GPS message. If successful, the resulting declination will be pushed to the vehicle and be posted as the Current declination. If the lookup fails, nothing will be pushed to the vehicle and "0.00" will remain in the Current declination. The system will continue to retry declination lookups every 5 seconds if valid GPS messages are present.

When auto-declination is active, "Lookup Declination" and "Update Vehicle" will be disabled.

If you disable Auto Declination, declination will not be updated until you manually update it.

If you enable Auto Declination, the first valid GPS fix will set the declination.

2.12.6.1.2.4 Lookup Declination

If you are using topside GPS, clicking Lookup Declination will update the declination to your current location.

NOTE: Lookup Declination requires a valid position.

The system will calculate the vehicle declination based on the value of the vehicle's current position. If the vehicle's position is 0,0 (as if no real position has been provided) it will calculate the declination at 0,0.

2.12.6.1.2.5 Update Vehicle

Updates the Vehicle's Declination to the value in the set declination field.

2.12.6.1.3 OpenINS Tools

2.12.6.1.3.1 Fuse USBL

Toggles whether the USBL (Ultra-Short Baseline) will be used as part of your navigation solution. The Navigation Solution is the estimation of where the system thinks the vehicle is. Under certain conditions, USBL can be noisy, or produce inaccurate readings, one of these situations can occur when the vehicle is near the ship.

Disabling this option will remove USBL as part of your navigation solution.

When enabled, Workspace will use the USBL readings as part of your navigation solution.

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2.12.6.1.3.2 Fuse GPS

Toggles whether the GPS will be used as part of your navigation solution. The Navigation Solution is the estimation of where the system thinks the vehicle is. GPS is only available when your vehicle is on the surface, and when surfacing the estimated vehicle position and GPS may differ.

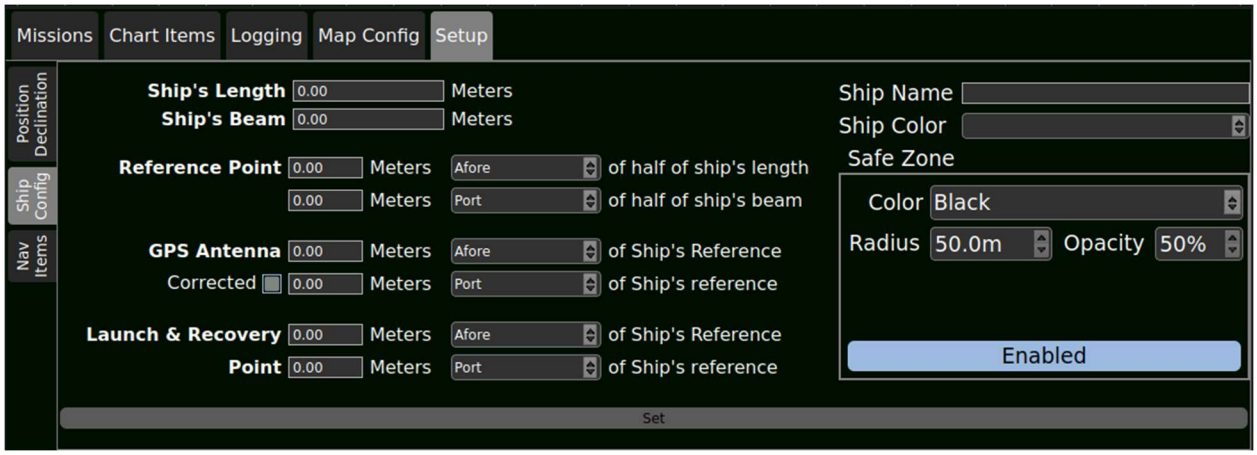
It is generally recommended to either disable Fuse GPS or disable positioning when bringing the vehicle to the surface.

Disabling this option will remove GPS as part of your navigation solution.

When enabled, Workspace will use GPS readings as part of your navigation solution.

2.12.6.2 Ship Config Subtab

Allows you to define the dimensions and locations of key vessel features, this includes designated reference point of the ship, the location of the GPS, and a launch/recovery point.



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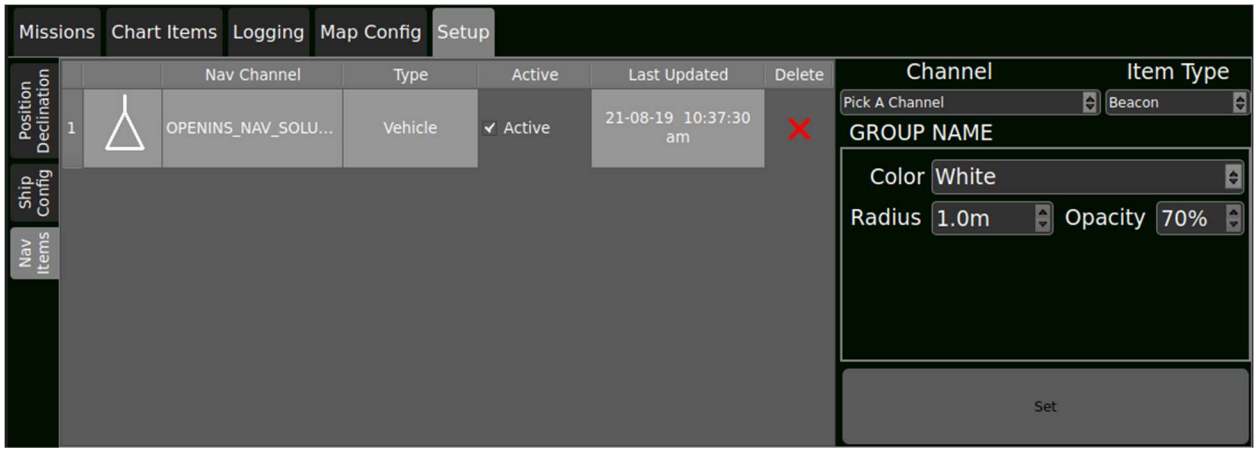
2.12.6.3 Nav Items Subtab



The Nav Items Subtab allows you to create or edit nav items that will appear on the mission view. Beacons can be used to include the location of a USBL, GPS, or other Nav Solution. An example of this may be to include your GPS as a beacon on the mission view, to allow you to see where GPS pings are coming from, and example of this can be found below. These can be used as part of troubleshooting or as points of reference.

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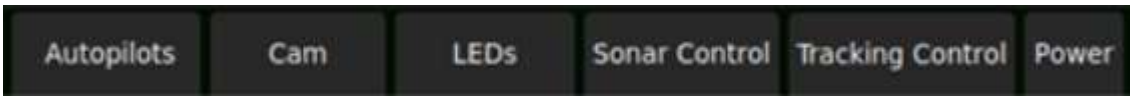
2.13 Control Tabs

The Control Tabs are a group of controls found in the lower-right corner of Workspace. They are available in all Flight View configurations except the Chart View. They can be toggled using the F6 Key.



2.13.1 Autopilots Tab

The Autopilots Tab allows you to control the vehicle while executing missions. For more information on dynamic waypoint positioning, look at Section 3.

NOTE: Many of the controls in the Autopilots Tab require you to be executing a mission, using auto-heading, auto-depth.

Icon	Name	Function
	Reverse	When enabled, will reverse the order of the waypoints the vehicle will follow while executing a mission.
	Back	Commands the vehicle to travel to the previous Waypoint on its current mission. Only usable if the vehicle is executing a mission.
	Hold	When enabled (Green) the vehicle will stop at the Active Waypoint it is currently traveling towards. Only usable if the vehicle is executing a mission.
	Forward	Commands the vehicle to travel to the next waypoint in order. If the vehicle is in transit to a waypoint, it will begin traveling to the next waypoint in the mission. Only usable if the vehicle is executing a mission.
	Speed Control	Increases or reduces the speed at which the vehicle travels between Waypoints. Requires the vehicle to be in transit to a waypoint.

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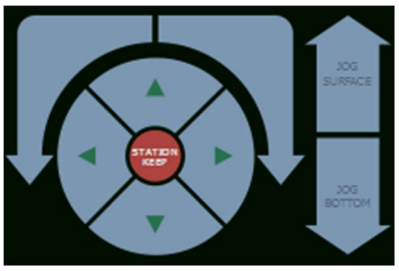

Jog Controls

Jog controls will control the location of the current Vehicle Waypoint. These will move from the perspective of the Vehicle.

The curved arrows require the vehicle to be using auto heading.

The Jog Surface and Jog bottom controls require the vehicle to be using auto-depth.

The Directional buttons require the vehicle to be in positioning mode.

Step Control

Step Control changes the distance the jog commands.

Each click of the jog controls will move the vehicle or waypoint a distance defined by the step controls. *

*This will be metric or imperial as defined in the mission view tools.

Speed Lock

Green - Vehicle Heading will be dictated by the value defined by the active waypoint.

Blue - You have active control of the vehicle speed.

NOTE: Manually adjusting the vehicle speed will disable the speed lock.

Heading Lock

Auto heading must be enabled for heading lock to work properly.

Green - The Vehicle Heading will be dictated by the value defined by the active waypoint.

Blue - You can control the vehicle heading independent from the current waypoint.

NOTE: Manually adjusting the heading will disable the heading lock.

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Depth Lock

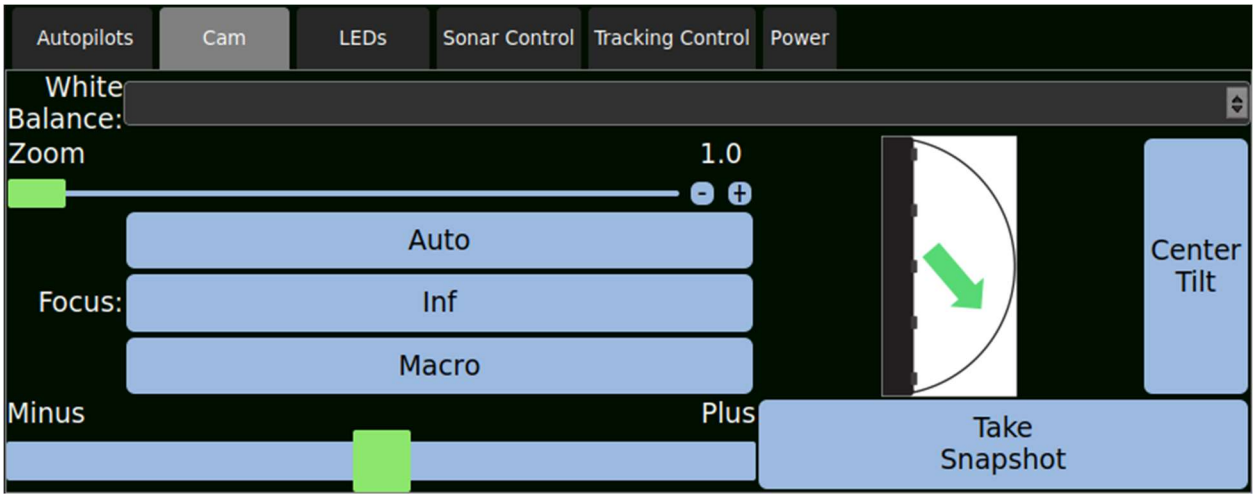
Auto heading must be enabled for heading lock to work properly.

Green - The vehicle depth will be dictated by the value defined by the active waypoint.

Blue - You can control the vehicle depth independent from the current waypoint.

NOTE: Manually adjusting the depth will disable the depth lock.

2.13.2 Cam Tab



Allows you to select the White Balance for changing light conditions, zoom, focus, and center the camera tilt. You can also use the Take Snapshot button to take a high-resolution picture using the onboard camera. The tilt indicator shows the current tilt angle of the camera.

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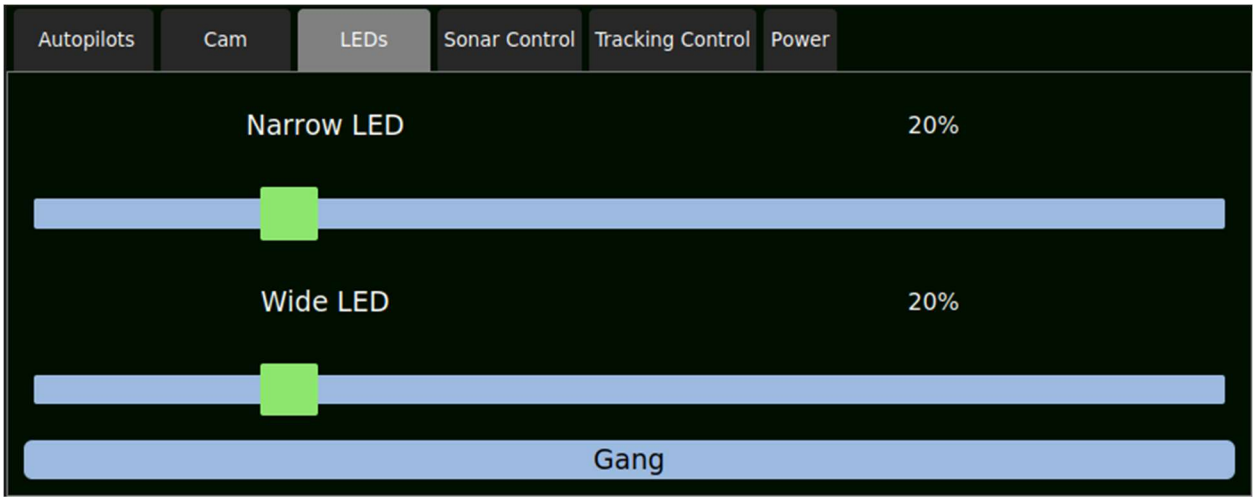
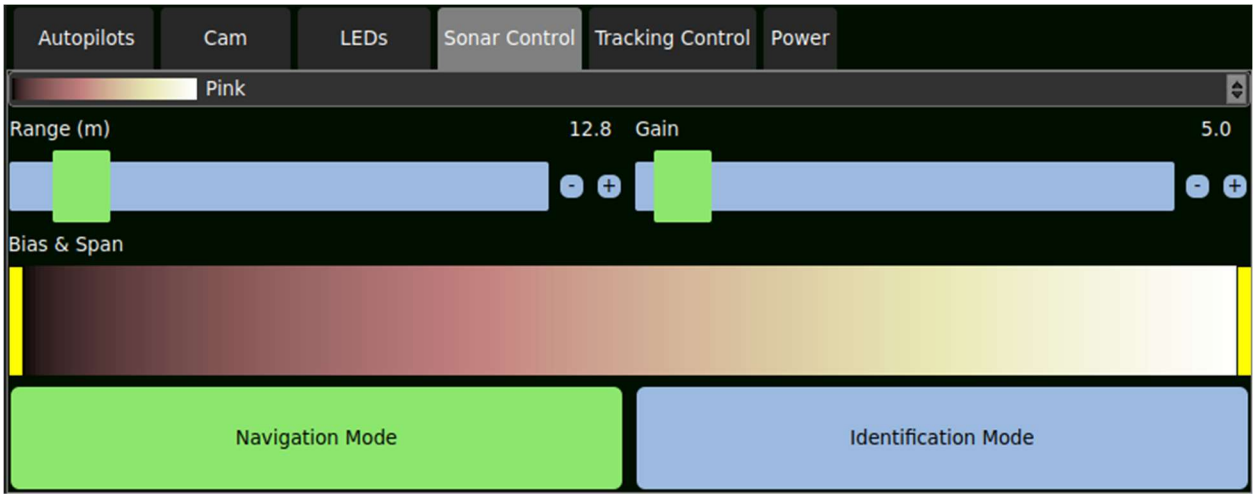
2.13.3 LEDs Tab



Control the total brightness of the LED banks. The Gang button ties these controls together.

2.13.4 Sonar Control Tab



Allows you to adjust the Sonar image, this includes palette, Range, Gain, Bias and Span.

2.13.4.1 Range

Range is the distance the sonar is monitoring and what is displayed in the Sonar View, it can be adjusted quickly using the slider or incrementally by using the - and + buttons to the right of the slider.

NOTE: When changing range, it is important to consider the size of the object that you are looking for; the larger the range, the smaller objects will appear in the sonar view. Additionally, be aware of your vehicle's speed when adjusting your sonar range the shorter the range, the less time you will have to react to an object. The example below shows the same object viewed at 26m and 9m range.

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2.13.4.2 Gain

Gain is a multiplier applied to information coming in from the return, by adjusting the slider or using the - and + buttons, you will increase the intensity of the colors used in the sonar image.

Too little gain will result in a mostly empty Sonar View, too far to the right and will result in close to the maximum color.

2.13.4.3 Bias and Span

Bias and Span work together to set upper and lower bounds of colors mapped to intensities, Additionally and the range of colors tied to intensities in the Sonar View.

It is important when adjusting bias and span to only map the sonar intensities that are significant.

All intensity values between bias and (bias + span) will be color mapped, any intensities below the lower threshold will be black, and above will be displayed at the maximum value.

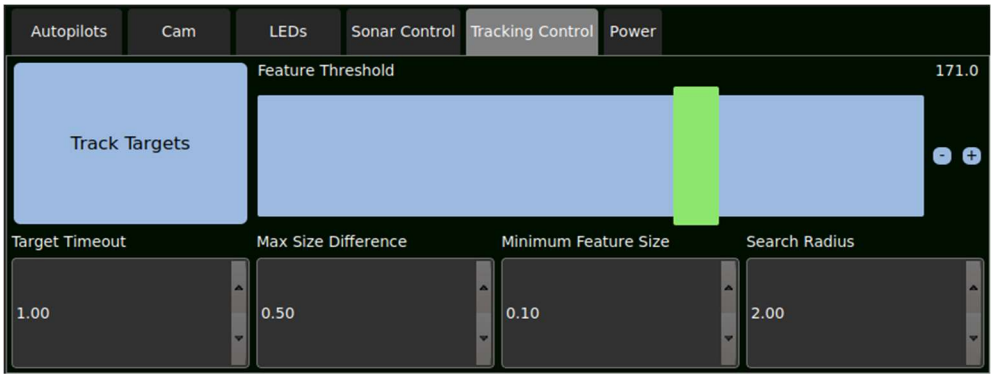
2.13.4.3.1 Adjusting Bias and Span

Bias and Span are adjusted by moving the yellow grab handle to the left and right. Additionally, the entire bar can be shifted to the left and right to further adjust the sonar color mapping.

All intensity values less than the bias will appear black on the screen.

All intensity values greater than bias + span will be displayed at the maximum color value of the palette.

2.13.5 Tracking Control Tab



Enables you to enable and tune the sonar target tracking. You can use these controls to isolate the object you want to track using Sonar Positioning.

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2.13.5.1 Track Targets

The track targets button toggles sonar target tracking. When enabled (colored green) the system will highlight targets that meet the criteria dictated by the target tracking details. While enabled, you can select a target to be tracked by clicking a highlighted object in the sonar widget.

2.13.5.2 Target Tracking Details

The target tracking details define the criteria that the system will use to track sonar targets.

2.13.5.2.1 Feature Threshold

Adjusts the strength of the sonar return that is required for the objects to be highlighted by the target tracking tool. This can be adjusted by using the slider or the – and + buttons to the right of the slider.

2.13.5.2.2 Target Timeout

The amount of time an acquired target can be out of view before target tracking will lose target lock. If this occurs, the target will need to be reacquired.

2.13.5.2.3 Max size difference

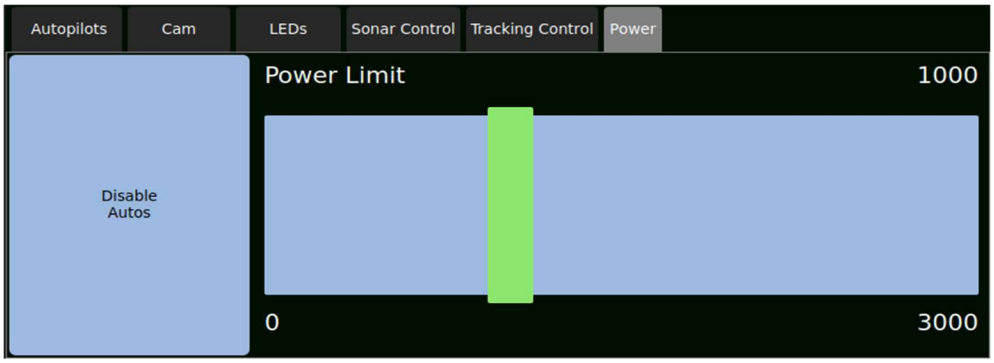
The amount a tracked object's size can change before it is recognized as a new object.

2.13.5.2.4 Minimum feature Size

The minimum size of an object selectable by the target tracking tool.

2.13.5.2.5 Search Radius

The search radius is an area around an object that is being tracked. The search radius will be centered on the object being tracked, if an object moves outside of the search radius too quickly it will no longer be tracked. Power Tab



The power slider sets the total thruster power. This will affect the autopilot controls overall aggressiveness.

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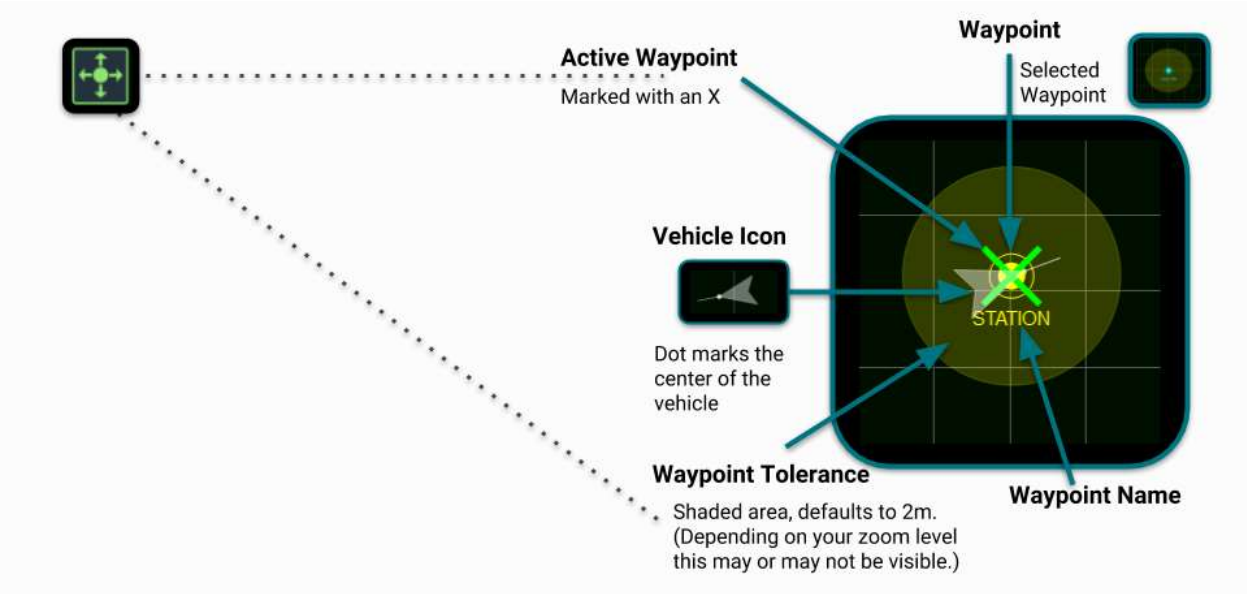
3 Dynamic Waypoint Positioning

Dynamic Waypoint Position is a fundamental concept of operation in EOD Workspace. You can control your vehicle by controlling waypoints in real-time without having to plan or push a mission to your vehicle. This section will describe how to direct your vehicle using Dynamic Waypoint Positioning.

3.1 The Waypoint

The first concept to understand with Dynamic Waypoint Positioning is the waypoint. A Waypoint in EOD Workspace is a location in three dimensions.



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The waypoint is surrounded by an area called the Tolerance; the Tolerance is the area surrounding the waypoint that the vehicle must reach in order to consider the waypoint achieved.

3.1.1 Types of Waypoints

There are three types of Waypoints found in EOD Workspace

- The Active Waypoint
  - The Active Waypoint is marked with a green X.
  - The Vehicle is trying to reach or is holding at this Waypoint.
  - Step Controls in the Autopilot Jog Window will move this Waypoint.

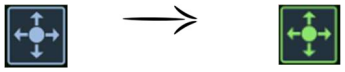
- Station Waypoint
  - Is Labeled STATION
  - A STATION Waypoint can also be the Active Waypoint.
    - When the STATION Waypoint IS the Active Waypoint, moving the joystick will move the vehicle, when the joystick returns to null the STATION Waypoint will move to the current vehicle position.

  - Step Controls in the Autopilot Jog Window will move this Waypoint.

    -

- Non-Station Waypoint
  - Named anything other than STATION (usually wypt_XXX) and not currently Active
  - If a Non-station Waypoint is the Active Waypoint
    - Moving the joystick will move the vehicle, when the joystick returns to null workspace will create a new Active STATION Waypoint that is part of the current active mission.

3.2 Enable Positioning



This is the first thing that you will need to enable before you can control your vehicle using Dynamic Waypoint Positioning. When you enable positioning, Workspace will create a mission with a single waypoint. This is your Station Keeping Waypoint.

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When you look at this waypoint, you will immediately see some details that will help you understand how to interact with Workspace to create and execute missions.

The most prominent thing you will see on the Station Keeping Waypoint is a bright green X, this marks the location the vehicle is currently traveling to. The vehicle will attempt to achieve and maintain its position based on the location of the X. As you eventually add more Waypoints, the X will always mark the location that your vehicle is traveling toward.

Waypoints are the building blocks of missions, you can control your vehicle by using a single waypoint, or you can define a specific path using multiple waypoints.

NOTE: Clicking the Positioning button will always stop your vehicle. If you need your vehicle to stop, enable positioning. If you need your vehicle to stop during a mission disable positioning. If currently using positioning, you can also displace the joystick to immediately have Workspace drop a new station keeping waypoint.

3.2.1 Using a Waypoint to Control your Vehicle

You can control your vehicle by moving the station keeping waypoint. When positioning is enabled, you can control the vehicle by moving the currently selected waypoint to a new location. To move the waypoint, click and drag it. The vehicle will move in a straight line to reach the location of the waypoint.

3.3 Controlling the Vehicle using Dynamic Positioning

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NOTE: Autopilot Jog controls will move the waypoint in relation to the orientation of the vehicle. The forward jog will move the waypoint away from the direction the front of the vehicle while the right jog will move the waypoint to the right of the direction the vehicle is pointing.

When you have positioning enabled you can control the vehicle by using the Autopilot Jog window to control the location of the current waypoint. The vehicle will follow this waypoint.

The Autopilot Controls are found in the control widget in the lower-left corner of Workspace.

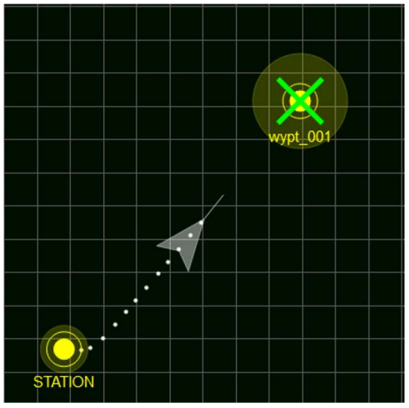
When you are using the Autopilot, Jog Controls to move the vehicle, it is important to understand that you are not directly controlling the vehicle. Instead, you are controlling the waypoint and the software is controlling the thrust so that the vehicle is following the waypoint. The vehicle will travel in a straight-line path from its current location to the location of the waypoint. You can use the Autopilot Jog controls to change waypoints on the fly as your mission parameters change.

3.3.1 Step Size Controls

There are some things to consider when using Autopilot Jog controls, first is determining if your current mission requires fine movement. You can adjust the commanded distance your vehicle will move each time you click or tap a control input.

If you want finer vehicle movement, you will likely want your vehicle to move less each time you click one of the Autopilot Jog directional controls. You can adjust the jog for XY jog, Turn Jog, and Z Jog independently.

3.3.2 Right Click and Go



With positioning enabled you can quickly command the vehicle to travel to a position by right-clicking on the map to open the mission view Pop-up menu and select the option Add and Go To Waypoint, this will add a waypoint and command the vehicle to travel to it. The vehicle will travel in a straight line to reach the new waypoint. As with the Station Keeping waypoint, you can left-click and drag this waypoint to direct the vehicle. You can also right-click a previously added waypoint to command the Vehicle to Go To Waypoint to direct the vehicle to travel to the selected waypoint.

NOTE: A Waypoint created using Right Click and Go will use the Waypoint defaults.

3.3.3 Vehicle Speed

You can control Vehicle Speed from the Autopilot Jogs Window by using the Turtle and the Rabbit. These are self-explanatory; the Turtle will slow down the vehicle while the Rabbit will speed up the vehicle.

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3.4 Creating a Mission Using Multiple Waypoints

Now that you're able to control the vehicle with a single Waypoint, the next step is to build a multi-waypoint mission. If this is your first time using multiple waypoints to control your vehicle try you find an unobstructed area free of obstacles.

Click the drop-down in the upper-right corner of the mission view and select Create Mission.... This will open the mission editing window and give you the ability to rename the mission, the mission name will default to the format YYYY-MM-DD. HHMMSS_mission. Once you have created the mission and selected a default color for the mission, click OK. Now you can start adding waypoints to your mission by right-clicking anywhere on the mission view and selecting Add Waypoint.

Select Pan to stop adding waypoints

Add a few waypoints at least 10 meters apart for a test mission. They will be connected by lines; these lines define the route the vehicle will travel on in order to complete its mission. As the vehicle executes this mission, it will attempt to travel along these lines.

Now that you have a few waypoints, right-click the first waypoint on the map and select Go To Waypoint. A few things should happen, Workspace will make the selected mission the Active Mission, the green X should appear on the selected waypoint and the vehicle will begin to travel directly to the selected waypoint. The route of the active mission will be highlighted by a thick dotted line. The Waypoint the vehicle is moving towards will always be marked with a green X. You can click and drag waypoints on the fly and the vehicle will change its course to reach the waypoint.

You can use the Autopilot Controls in the control widget to move the current active waypoint, its speed, and whether the vehicle will hold at each waypoint before continuing its mission. You can find the Autopilot controls in the Control Widget in the lower-left corner of Workspace.

Autopilots Control

Heading Locked to Waypoint

Depth Locked to Waypoint

When controlling a vehicle during a multi-waypoint mission, the first thing you should look for is if the Hold Button is enabled

or disabled

if the hold button is enabled, the vehicle will stop at each Waypoint and hold until you command the vehicle to move to the next or previous waypoint using the forward and back buttons. If the Hold button is disabled,

the vehicle will automatically begin traveling to the next Waypoint as soon as the Vehicle reaches the waypoint tolerance of the current waypoint.

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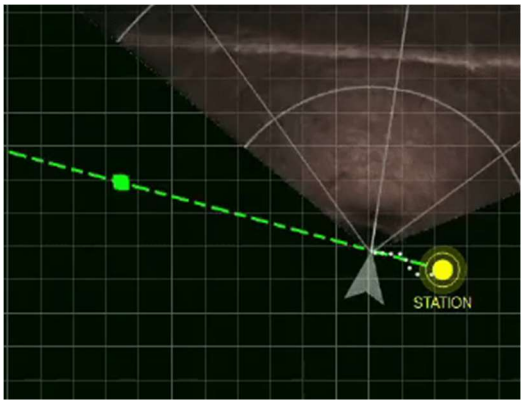
By default, when auto heading is enabled, Workspace will adjust the vehicle heading to face the current waypoint it is traveling toward. It will also, if auto depth is enabled, adjust the vehicle's depth to match that of the Waypoint. If you want to have independent control of either heading or depth, unlock the Heading and Control in Autopilot Jogs Window (these are shown to the right). With these unlocked, you will be able to use the Autopilot Jog Controls or the vehicle controller to control the vehicle's heading and depth independent of waypoint variables as it moves through mission waypoints. The independent heading control can be used to have the vehicle move laterally to survey features (shown below). When you re-engage the Heading and Depth locks, the vehicle will return to facing the waypoint, and will raise or lower its depth to that of the current waypoint.



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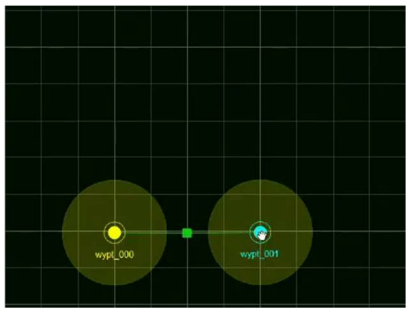
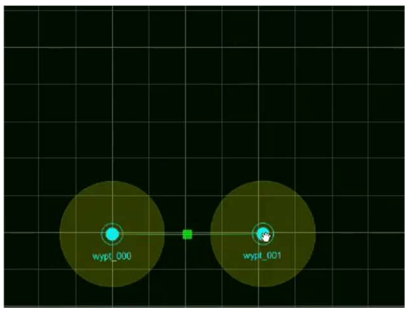
3.5 Dynamic Line Positioning

Each mission is defined not only by the waypoints that comprise it but, more importantly, by the lines between those waypoints. The vehicle will attempt to follow the lines between waypoints while completing missions. When you move a waypoint, you will change the lines connecting them. You can move a single waypoint by clicking and dragging it, or you can move multiple waypoints by holding the CTRL button when selecting waypoints. When you select and move multiple waypoints at once, the selected waypoints will keep their orientation to each other.

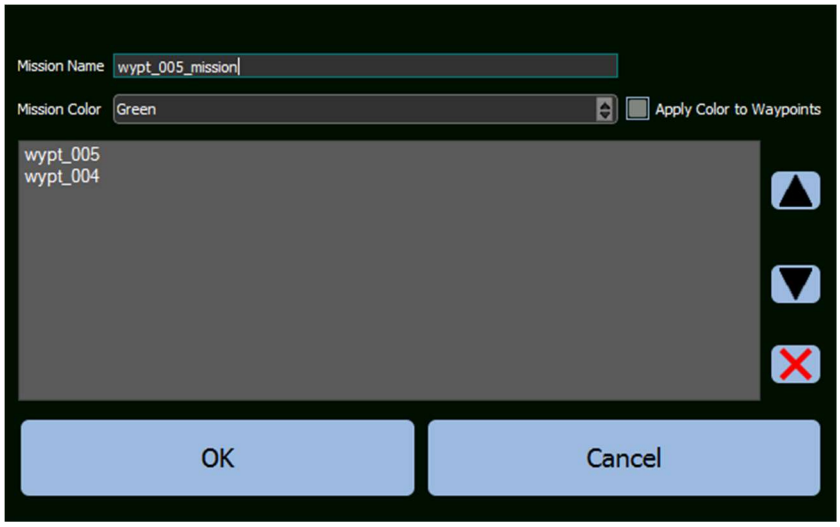


Moving a single Waypoint



Moving Multiple Waypoints

3.5.1 Waypoint Order



By default, the order of the waypoints will be the same as the order they are added to the map. You can click and drag waypoints to reorder their positions to reorganize the mission. Alternatively, you can reorganize the waypoint order within a mission. By double-clicking the mission from the Missions List found in the Missions tab you will open the Edit Mission Window. This will allow you to change the default color of the mission route or change the order of mission waypoints. To do this, click the waypoint you want to change and then use the up and down arrows to change the position of the waypoint in the list. Click the OK button to change the mission.

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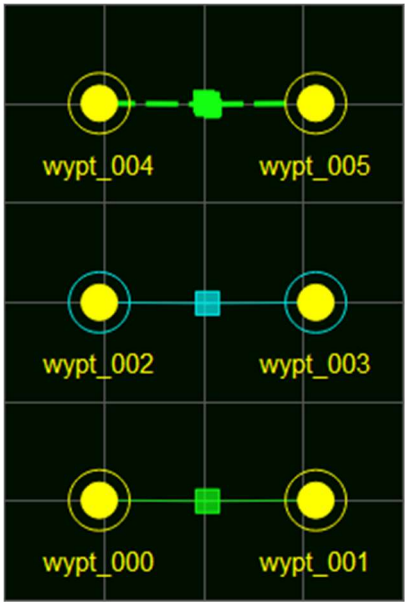
3.6 Multiple Missions

There is no limit to the number of missions you can have in Workspace. However, when you have multiple missions, it is important to be able to keep them straight when working with them. In this section, we'll walk through how to differentiate and work with multiple missions.

3.6.1 Differentiating Between Missions

The first thing you will want to be able to do is to quickly differentiate between missions.



Line Types - There are two basic line types differentiating Missions.

- Thick Dotted Lines - (Shown in the image to the left at the top) This marks the current mission the vehicle is undertaking.
- Thin Solid Lines - These mark other missions. These have been created, but the vehicle is not currently undertaking.

Line Colors - Mission routes will, by default, be colored green (shown at the bottom of the image to the right). You can change the color of each mission individually when editing a mission.

- Cyan - Mission lines that are colored Cyan (shown in the middle of the screenshot to the right) have been selected using the Mission tab in the mission view tools menu at the bottom of the screen.

NOTE: If the mission has only a single waypoint, the circle around the single waypoint will be colored cyan. This can be slightly confusing as when the individual waypoint is selected the entire waypoint will be colored cyan.

3.6.2 Changing Missions

There are two main ways to select a mission as the current mission. You can right-click on a waypoint that is part of the mission and select Go To Waypoint. Workspace will make the mission the waypoint is a part of the active mission and direct the vehicle will go directly towards the selected Waypoint. You are also able to use the Missions Tab, select the mission from the Missions List, and click the Execute Mission Button. If you do this the vehicle will head directly towards the first Waypoint and will follow the Mission according to what has been enabled in the Autopilot Jogs window.

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3.6.2.2 Directing to the First vs Subsequent Waypoints

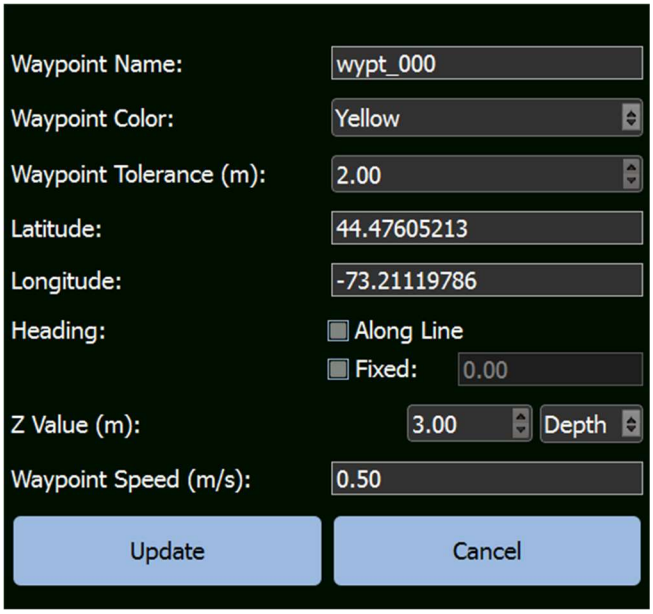
When you are directing the vehicle to Go To Waypoint it is important to understand the behavior of the vehicle. If you are directing the vehicle to go to the first waypoint in the mission, it will take the most direct route to the waypoint. However, if you direct the vehicle to travel to any other waypoint it will attempt to follow the line first before trying to achieve the Waypoint.

NOTE: If the Waypoint has a defined heading, and auto heading is enabled, the vehicle will travel using the routes described above, but it will use the defined waypoint heading.

3.6.3 Adding Waypoints to a Specific Mission

To add a waypoint to the specific mission you need to first select it from the Mission Dropdown on the upper right corner of the Map. Whenever you add a waypoint, it will be added to the mission indicated in the drop-down.

3.7 Editing Waypoint Details



Every waypoint has a set of details that can be edited, these changes will affect how the vehicle will interact with the Waypoint. These can be accessed by right-clicking a waypoint and selecting Edit Waypoint... from the list. The first major detail that can be edited is the Waypoint Tolerance(m) this is the radius around the Waypoint; when the vehicle reaches the Waypoint Tolerance, it will consider the waypoint achieved and, if the mission is not paused, will begin traveling to the next waypoint.

You are also able to define the exact latitude and longitude of the Waypoint. This allows for you to move a waypoint to an exact location.

The Heading option allows you to select one of two options:

- Along Line means that, in a multi-waypoint mission, the vehicle will set its heading to match that of the line connecting waypoints. or
- Fixed allows you to define a specific absolute heading that the vehicle will maintain while traveling to waypoints.

Z Value (m) allows you to define the vertical location of the waypoint. This will be either depth or altitude and will be informed by the waypoint tolerance.

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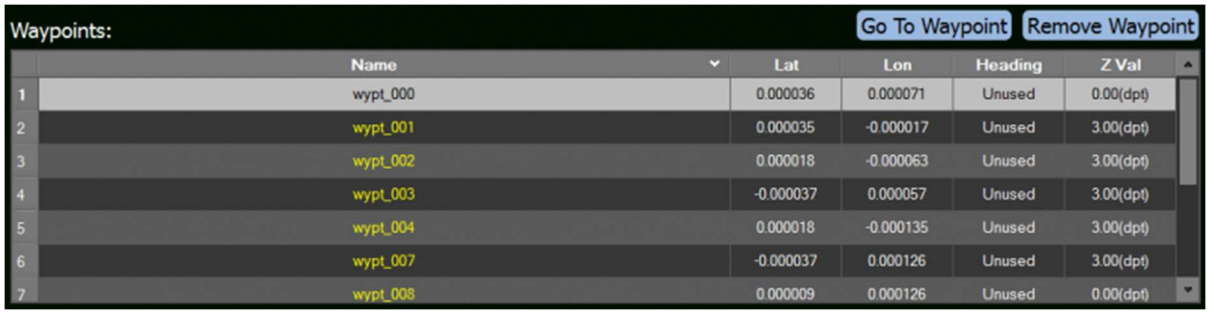
3.8 Using the Mission Tab

Up until this point, you have been editing missions directly by clicking the map, using the quick menus, but you can also edit both missions and waypoints from the Missions Tab in the mission view tools. The Missions Tab is divided into two different areas: Waypoints and Missions.

3.8.1 Selecting Waypoints Using the Mission Tab



	Name	Lat	Lon	Heading	Z Val
1	wypt_000	0.000036	0.000071	Unused	0.00(dpt)
2	wypt_001	0.000035	-0.000017	Unused	3.00(dpt)
3	wypt_002	0.000018	-0.000063	Unused	3.00(dpt)
4	wypt_003	-0.000037	0.000057	Unused	3.00(dpt)
5	wypt_004	0.000018	-0.000135	Unused	3.00(dpt)
6	wypt_007	-0.000037	0.000126	Unused	3.00(dpt)
7	wypt_008	0.000009	0.000126	Unused	0.00(dpt)

You can use the Waypoints Tab to select an individual waypoint from the list, just like with clicking a waypoint on the map you can ctrl-click to select multiple waypoints. Additionally, in the Waypoints List, you can shift-click to select all waypoints between the first and last selected waypoints.

You can also use this interface to select and go to a single waypoint.

NOTE: There is no confirmation when removing waypoints, keep this in mind before you remove a waypoint.

3.8.2 Selecting Missions Using the Missions Tab

You can select your missions from the mission list in the Missions tab. As with Waypoint List, you can select an individual mission from the list, or ctrl-click to select multiple missions. Additionally, in the Missions List, you can shift-click to select all missions between the first and last selected waypoints.

Once you have selected a single mission, you can use the execute mission option to command the vehicle execute a mission starting at the first waypoint, or remove it, which will delete all waypoints associated with the mission.

NOTE: There is no confirmation when removing waypoints, keep this in mind before you remove a waypoint.

3.8.3 Saving Missions

To save all missions for future use, clicking the Save button at the bottom of the Missions Tab. This will save all missions, waypoints, and markers (both standard and MOB) that are currently in your Workspace session.

NOTE: Regions are saved separately.

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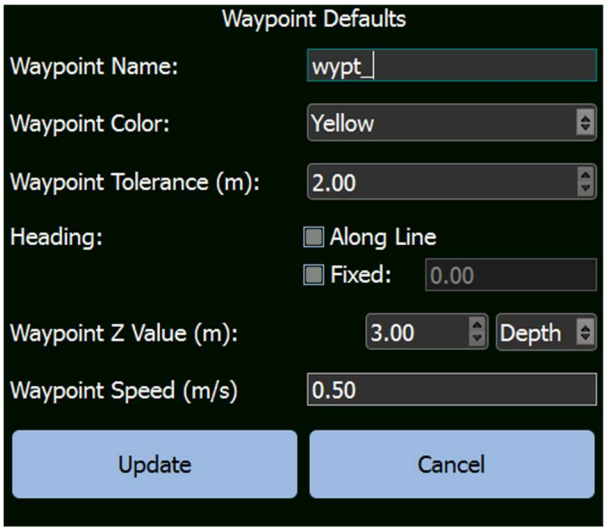
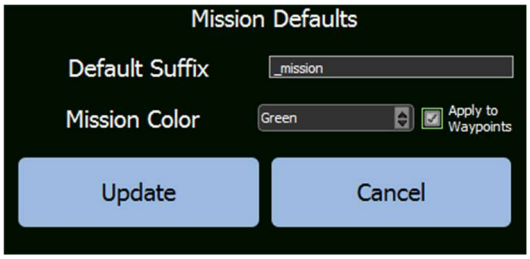
3.8.4 Changing Mission and Waypoint Defaults

From the Missions Tab, you can change both waypoint and mission defaults. Clicking on either the Waypoint Defaults... or Mission Defaults... button will allow you to change the defaults for all future Waypoints and Missions.

NOTE: Changing defaults does not retroactively change previously created waypoints or missions. Default changes will only affect missions and waypoints created after the change.





3.9 Point of Interest Control

To enable Point of Interest (POI) Control, click the icon to the left in Workspace. When enabling POI Control, Workspace will orient vehicle control to a specific point. This point will be marked as a green X without a Waypoint. Both Workspace and Vehicle Controls will be oriented towards this point; forward will move the vehicle closer to the Point of Interest and left and right will cause the vehicle to orbit to the left and right of the POI at a constant radius.

NOTE: Enabling POI Control will disable Positioning and enabling Positioning will disable POI Control.

3.9.1 Setting your POI

You can set your POI in one of two ways,

1. You can click the POI Control button and then left-click a point on mission view or,
2. You can right-click a point on the map where you want to place the POI and select the Set Point of Interest from the pop-up menu.

Either option will have the vehicle will orient itself to look at the point of interest while holding its position.

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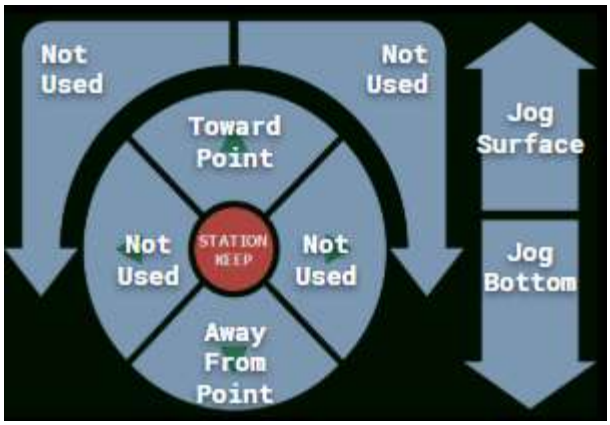
3.9.2 Controlling the vehicle with the POI

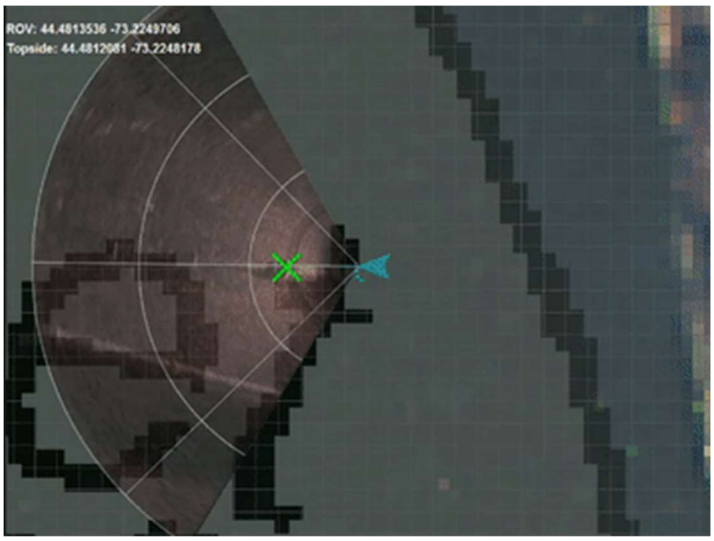
When you enable POI, control of the vehicle will change all control to be oriented towards the defined point.

The following control changes occur when POI Control is enabled.



3.9.3 Using the Sonar Fan and POI

In the upper-right corner of the sonar widget, you will see the icon to the left. Enabling this will overlay the sonar fan onto the map. You can then use the overlay to select a point that you want to set as your Point of Interest. In the example to the right, you can see the vehicle orbiting a location on a pipeline.



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3.10 Sonar Relative Control

Sonar relative control is enabled from the Control Bar if you have Track Targets enabled in the Control Tabs.

3.10.1 Track Targets

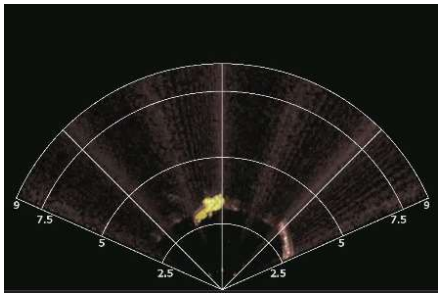
The Track Targets button toggles object tracking for items appearing in the sonar fan, only objects that meet the criteria defined in the Tracking Control panel will be tracked.

For more information about the tracking control panel see section 2.13.5 Tracking Control Tab.

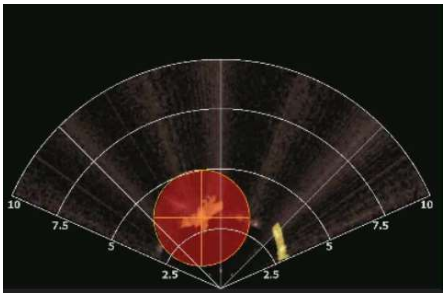
CAUTION: Sonar is not exact, and target tracking will lose lock if an object is out of sight or if the object is eclipsed by another object.

3.10.2 Click to Acquire a Sonar Target

After you have enabled and defined your tracking criteria, objects that meet the tracking criteria will be highlighted yellow. You can select an eligible item for tracking by double-clicking on it in the Sonar Widget.



Sonar Target Tracking without Target



Sonar Target Tracking - Target Acquired

Once you have acquired the target, you are able to use alternative autopilot options, such as Sonar Relative Control.

3.11 Waypoints and Regions

3.11.1 Creating a Mission Using Regions

A Region in Workspace is a defined geographical location based around an initial point called a Reference Point. All other points that define a region will maintain a fixed distance from the Reference Point, allowing you to move Regions. These regions can then be used to quickly create survey missions.

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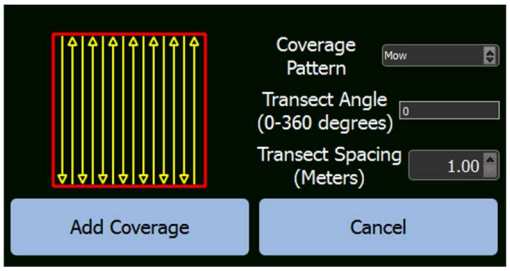
3.11.2 Creating a Region

To create a region, you need to open the Map Config tab in the mission view tools menu and open the Regions subtab. Click the **New Region** button to start clicking on the mission view to add a point, the first point will be your Reference Point. While you are creating a Region every time you click the mission view, you will add a point to the region. When you have finished defining your region, click the Green **Add Points** button, this will stop adding points to the region. If you want to add points later, select the region from the Regions List and then click the **Add Points** button.

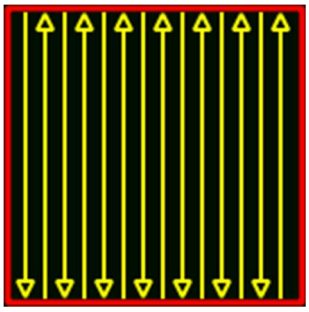
NOTE: Each new point must expand the region area, you cannot add a point to an area that within a region.

3.11.3 Creating a Mission using a Region

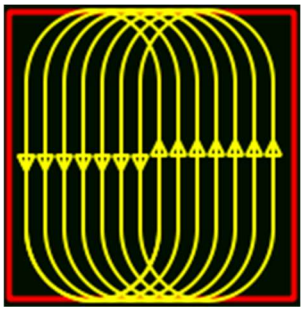
You can use a region as the basis of a survey mission, creating a defined waypoint mission. To create a region-based survey mission, right-click on the region and select **Set Coverage**, this will open the Define Region Coverage window.



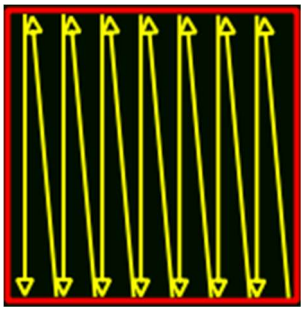
After opening the Define Region Coverage window, the first thing you will want to do is to select is your coverage pattern. This is the pattern Workspace will use to generate a mission to cover your defined region. There are three basic pattern types available in Workspace: Mow, Gapped, and Sawtooth. They are shown below.



Mow



Gapped



Sawtooth

The type of pattern you will want to choose will depend on the type of survey you are performing; generally, for an average quick survey, the **Mow** pattern is usually a good place to start.

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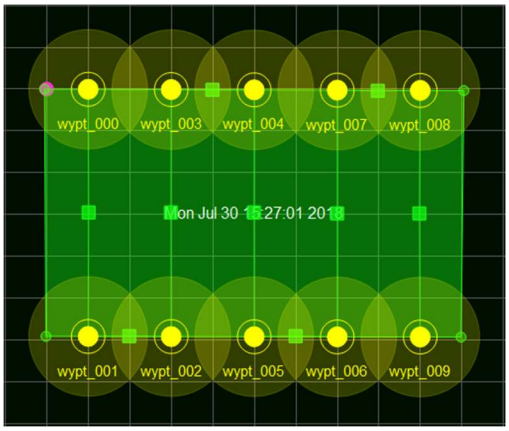
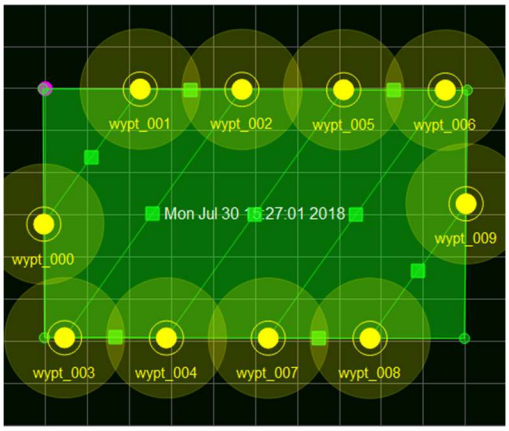
Once you have selected a pattern you want to use to generate a mission, you can modify the orientation of the coverage pattern as it is drawn in the region by selecting a Transect Angle. This will change the rotation of the pattern in relation to the region. The below example is using the Mow Pattern at 0° and 45°.



Transect Angle 0°



Transect Angle 45°

Finally, you can select the spacing distance between each transect by editing the Transect Spacing. A smaller number will result in a finer-grained survey path with more waypoints and a longer mission time, a larger number will result in fewer waypoints, a faster mission time, but this mission might be less thorough.

Once you've detailed your coverage click the **Add Coverage** button to generate your mission.

3.11.4 Region and Mission Interaction

After you have created a mission to cover a region, you are able to either interact with it independently or as part of the region. You can add, move, or remove individual waypoints as with any other mission. You can also use the region as a shortcut to interact with the mission you created.

If you move the region, you can create another mission from it. **NOTE:** That there can only be one mission associated with a region, creating a new mission from a region will delete the previous mission created for the region.

You are also able to start a region coverage mission by right-clicking the region and selecting **Execute Mission**.

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4 Diagnostic View

The Diagnostic View is generally not used while performing tasks or completing operations. There are four tabs in the Diagnostic View: Vehicle Configuration, Vehicle Network, Vehicle Sensors, and In this view, you will be able to see the status of all navigational devices connected to both Topside and Subsea as well as the status of vehicle thrusters (if applicable).

Areas of the Diagnostic View are surrounded by colored borders, these can be either red, green, or gray.

- Green – The component is currently communicating with Workspace.
- Red – The component is not currently communicating with Workspace.
- Gray – The has not yet communicated with Workspace.

4.1 Vehicle Configuration

Vehicle Configuration is broken into four sub areas.

4.1.1 Temperature

The current Water Temperature. Surrounded by a colored box, it can have two states Red or Green. This tells whether Workspace is receiving data from the sensor.

- Green - The Sensor is communicating.
- Red - The Sensor is not communicating.

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4.1.2 Joystick Data

Surrounded by a colored box, it can have two states Red or Green. This tells whether Workspace is receiving data from the Joystick.

- Green - The Sensor is communicating.
- Red - The Sensor is not communicating.

Communicates the position of each Hand Controller Joystick input. This is useful for diagnosing hand controller inputs that are not in null.

4.1.3 Buttons

Surrounded by a colored box, it can have two states Red or Green. This tells whether Workspace is receiving data from the Joystick.

- Green - The Sensor is communicating.
- Red - The Sensor is not communicating.

There are three possible statuses for each possible button LED.

- Blue - The button is inactive, not currently being pushed.
- Green - The button is active; this will only be green when the button is pressed.
- Grey - The button is unavailable, not currently active.

4.1.4 Video Overlay

You can use this interface to enable of disable text that will appear on the video Overlay.

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4.2 Vehicle Network

Details the status of each device connected to the network. This includes the thruster, LED and Camera tilt. The LED for each device identifies whether the device has faulted, available information from the device, and Network ID of the device.

Each thruster is surrounded by a colored box, that can have two states Red or Green. This tells whether Workspace is receiving data from the thruster.

- Green - The thruster is communicating.
- Red - The thruster is not communicating

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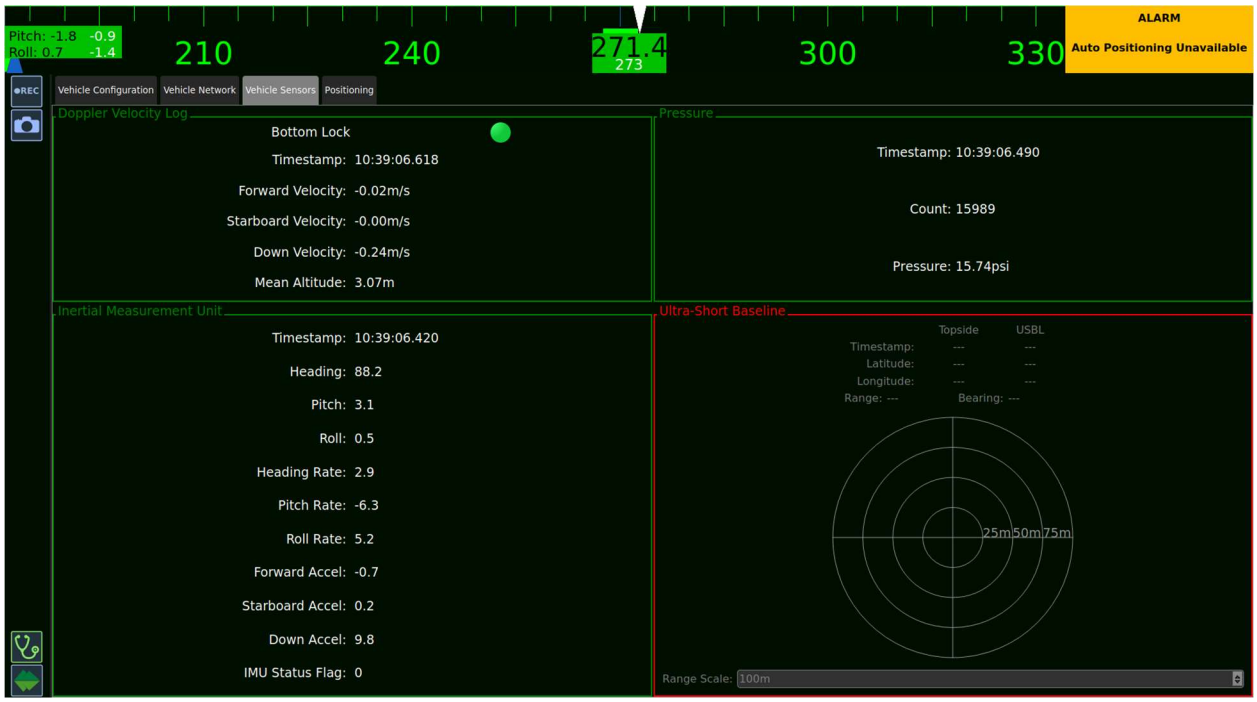
4.3 Vehicle Sensors

This is the raw sensor data that contribute to the navigation solution. Each sensor is surrounded by a colored box, that can have two states Red or Green. This tells whether Workspace is receiving data from the sensor.

- Green - The Sensor is communicating.
- Red - The Sensor is not communicating.

Provides the status for the Inertial Measurement Unit (IMU), Pressure Sensor, Doppler Velocity Log (DVL), and Ultra Short Baseline (USBL). If you are having any problems with any of these sensors, this is the first place to look.



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4.4 Positioning

Information regarding the Vehicle GPS and Topside GPS (If present).

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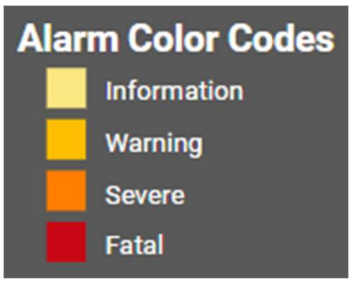
5 Alarms



Alarms are used to alert you when a specific criterion is met. These can be based around any signal, this can be the vehicle reaching a certain depth, or a loss of comms.

Currently active alarms will appear at the upper right-hand corner of Workspace. There are four alarm severity levels ranging from information only, to fatal.

The default alarms and their meanings are listed below.

Alarm	Severity	Meaning
Pitch Control	Info	Pitch Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Roll Control	Info	Roll Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Depth Setpoint Far	Info	Depth setpoint error is too large this could mean that you have pushed the setpoint beyond the bottom. The vehicle may be running into the ground.
Alt Setpoint Far	Info	Altitude setpoint error is too large this could mean that you have pushed the setpoint beyond the bottom. The vehicle may be running into the ground.
Heading Control	Info	Heading Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Warning Thruster Comms Slow	Warning	The communications to the thruster network has slowed. Typically this means a fault within the thruster system. Check thrusters or power to the vehicle.
LED Hot	Warning	LED has gotten hotter than recommended.
Auto Positioning is Unavailable	Warning	The vehicle DVL has lost bottom lock and Dynamic Positioning and POI are unavailable, this can mean that the vehicle is either too close or too far from the bottom.
Nav Initializing	Severe	This occurs when the vehicle is powering on. Wait until this clears before piloting the vehicle.
DEPTH FAIL	Severe	Pressure sensor has failed.

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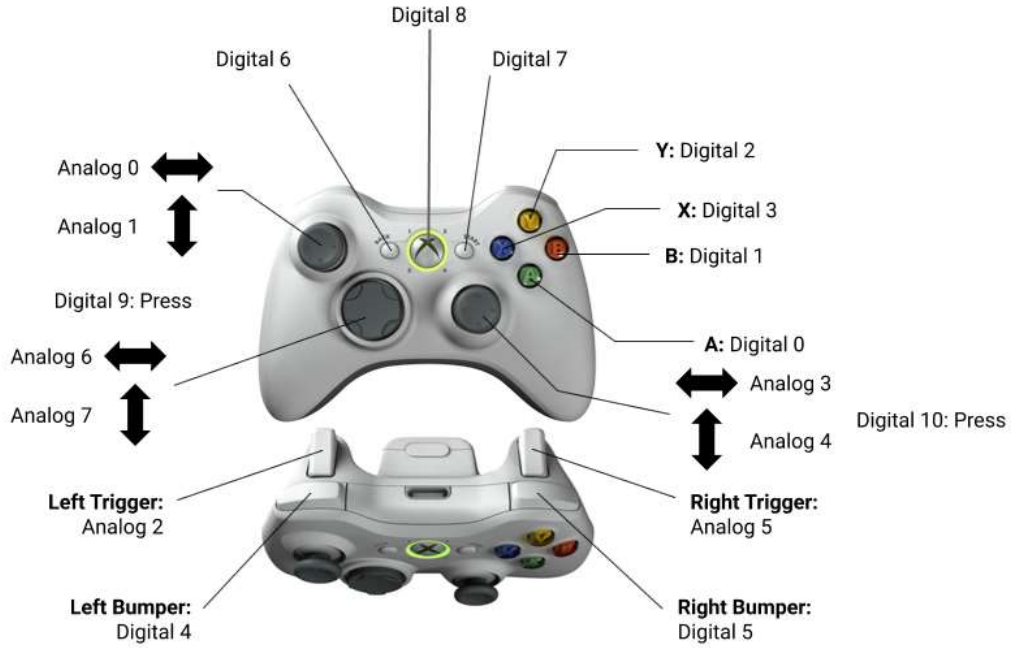
6 Appendix

6.1 Controller Inputs

6.1.1 Raw Controller Inputs



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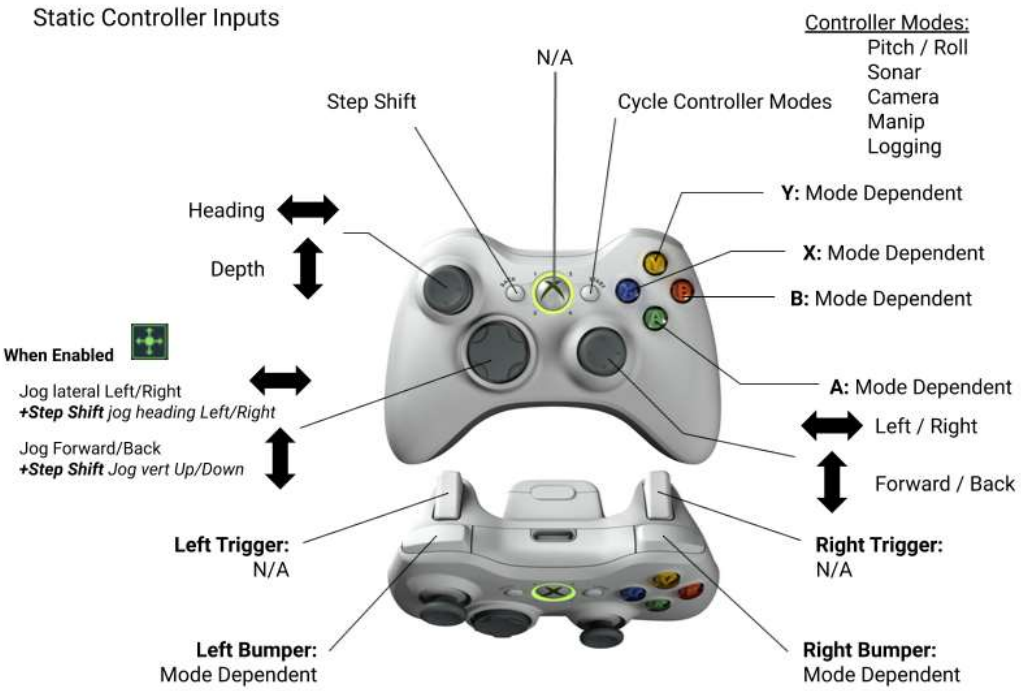
6.1.2 Static Controller Inputs



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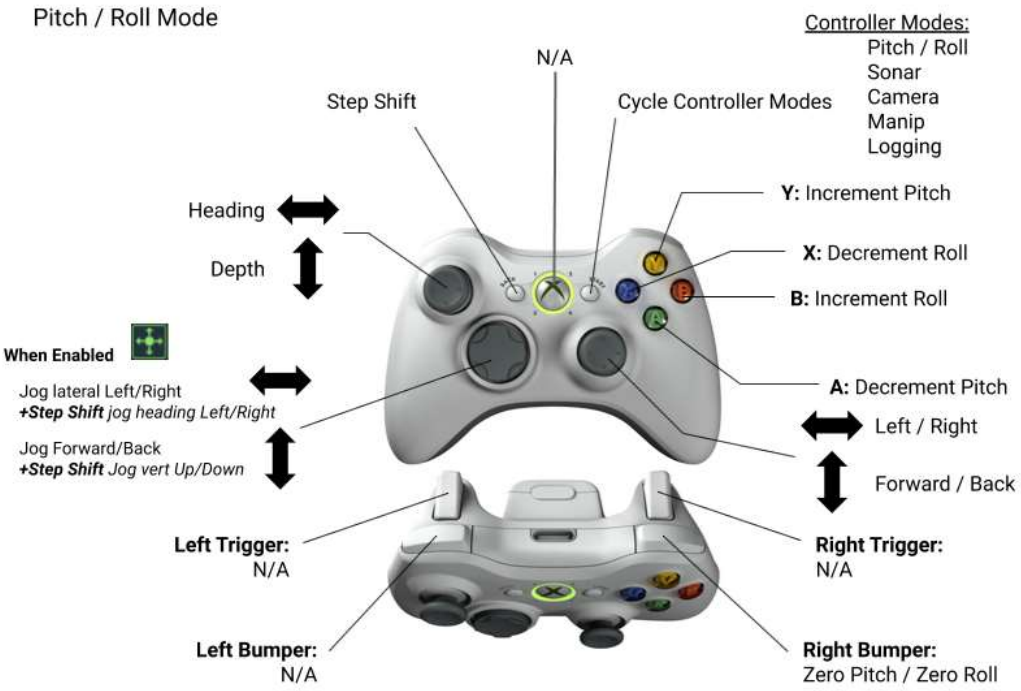
6.1.3 Pitch & Roll Mode



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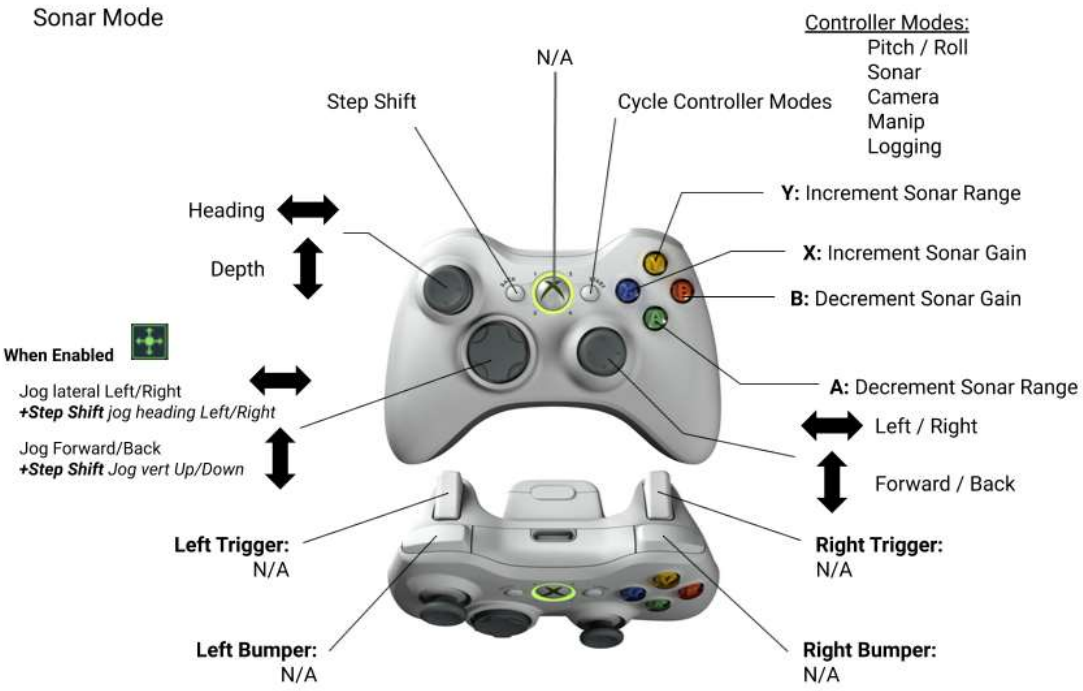
6.1.4 Sonar Mode



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6.1.5 Camera Mode

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6.1.6 Manip Mode

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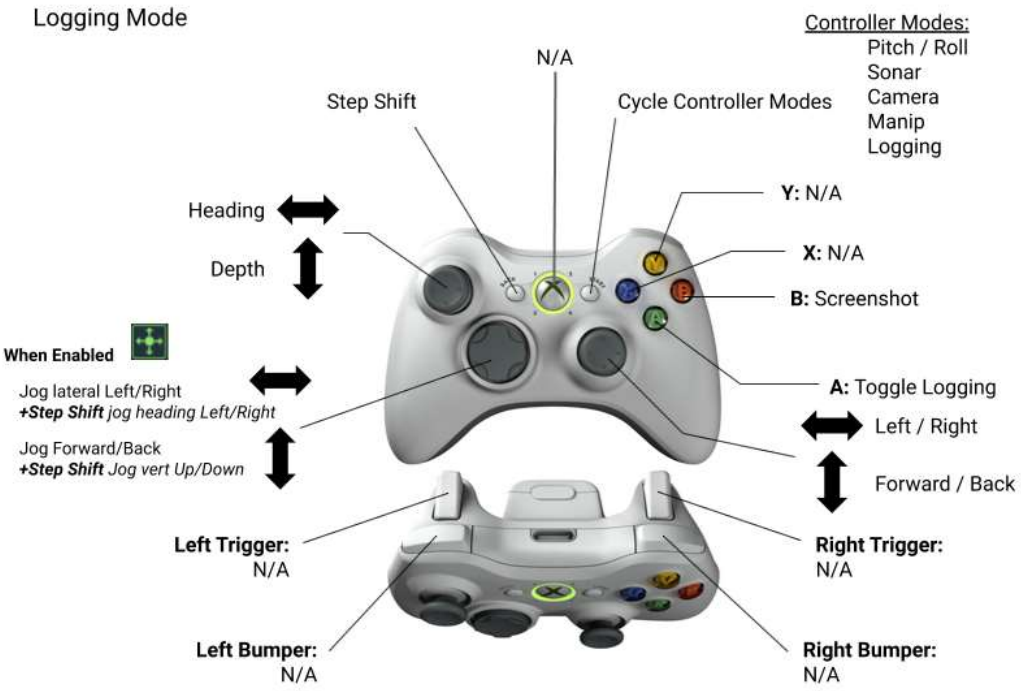
6.1.7 Logging Mode



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