X. The Observer and Viewing Scenarios

The observer, or eyepoint, is the location in the 3D or 2D environment from which you observe the scene. You can move the observer (navigate) through the scene. You can attach the observer to a simulation object or prop. When the observer is attached to a simulation object, it moves automatically with that object. You can also control the observer from a remote application using view control messages.

You can have multiple observers in a VR-Forces session. They might be associated with different windows. For example, you could have an observer for the main window and one for an inset window.

The observer is such a pervasive component of the VR-Forces GUI that it is covered in multiple places in this manual.

- "Chapter 2. The Observer and Observer Modes" on page 3
- "Chapter 3. Moving the Observer" on page 15
- "Chapter 4. Attaching the Observer to Objects" on page 47
- "2.10. Displaying Models for Remote Observers" on page 13

2. The Observer and Observer Modes

This chapter explains how to create, edit, and change observers and observer modes. For details about moving the observer, see "Chapter 3. Moving the Observer" on page 15. For details about attaching the observer to simulation objects and props, see "Chapter 4. Attaching the Observer to Objects" on page 47.

2.1. Switching Between the 2D and 3D Projections

VR-Forces supports both 2D and 3D projections. You can switch between them simply by changing the observer mode from Stealth or Out-the-Window to Plan View. (Changing observer modes is described in "2.3. Changing the Observer Mode" on the facing page.) When you go from a 3D observer mode to 2D, VR-Forces calculates a zoom level so that the observer should appear as if it is roughly the same height above the terrain. When you go from a 2D observer mode to 3D, VR-Forces calculates an altitude to do the same thing, and keeps the 3D view pointing down (so the change in overall view stays fairly small).

2.2. Observer Modes

Observer modes let you configure VR-Forces settings that affect how the observer moves and what it sees. You can then quickly change from one group of settings to another by switching between observer modes. An observer mode specifies:

- A model set. A collection of models of a particular type, such as 3D models.
- A key map. A coordinated set of key mappings to movement functions.
- A projection (2D or 3D).
- Settings for simulation object graphics and observer movement.

VR-Forces includes the following observer modes:

- Stealth. Stealth observer mode is a 3D projection configured for situational awareness.
- Out-the-Window. Out-the-Window observer mode is configured for when you use VR-Forces as a desktop image generator. It hides many of the explanatory visual effects present in the Stealth observer mode.
- Plan View. The Plan View observer mode provides a 2D "big picture" view of the terrain.
- XR. XR, or exaggerated reality, observer mode is a 3D mode that helps you understand the relationships between entities and the terrain when the observer is too far away from entities to view them at realistic sizes. It allows you to exaggerate entity size and terrain.
- IR BlackHot (CameraFX). A view using the CameraFX IR (infrared) BlackHot sensor.
- IR (CameraFX). A view using the CameraFX IR sensor.
- NVG (CameraFX). A view using the CameraFX NVG (night vision goggles) sensor.
- Camera (CameraFX). A view using the Visual Camera CameraFX sensor.

The observer modes all support the three model sets: 3D models, 3D colorized models, and 2D icons. You can edit observer modes and add new ones. For details, see "2.4. Creating and Editing Observer Modes" on the facing page.

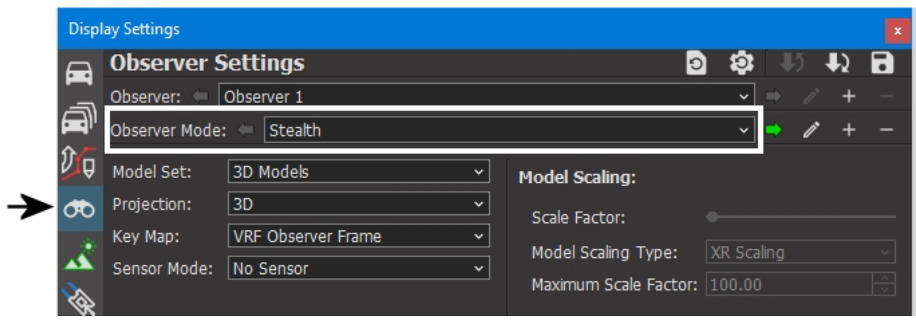
2.3. Changing the Observer Mode

When you change the observer mode, terrain may be displayed differently and the model sets used to display simulation objects may change. For descriptions of the observer modes, see "2.2. Observer Modes" on the previous page.

➤ **To change the observer mode:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 1).

Figure 1. Observer Settings page



3. Select an option in the Observer Mode list.

> ⓘ You can also change the observer mode by choosing **Observer > Set Observer Mode >** *mode*, or on the Observer Settings Toolbar, choose an option from the Observer Mode list.

2.4. Creating and Editing Observer Modes

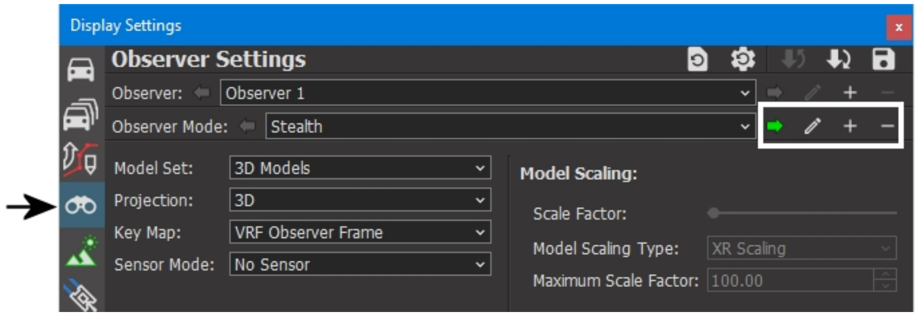
VR-Forces comes with 3D and 2D observer modes. (Table 1 on page 21 lists the observer modes available for each VR-Forces application.) They are configured with the display settings, key mappings, and model sets that users most commonly want to use. However, if they do not meet your needs, you can easily edit them or create new observer modes.

2.4.1 Creating an Observer Mode

➤ **To create an observer mode:**

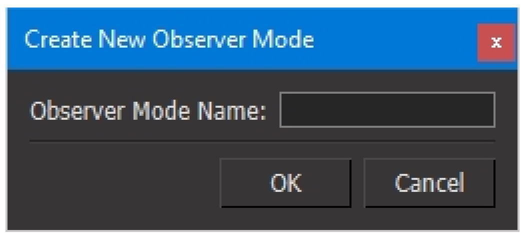
1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2).

Figure 2. Observer Settings page



3. Click the Add button (+) to the right of the Observer Mode list. The Create New Observer Mode dialog box opens (Figure 3).

Figure 3. Create New Observer Mode dialog box



4. Type a name for the new observer mode.
5. Click OK.
6. In the Model Set list, select a model set.
7. Select a projection (2D or 3D).
8. Select the key map you want to use.
9. Optionally, specify a sensor mode.
10. Optionally, change the observer speed scaling settings and speed scaling mode.
11. Optionally, for 3D model sets, change the Model Scaling settings.
12. Enable or disable the mode-specific settings. The list of settings varies depending on the projection and model set.

2.4.2 Deleting an Observer Mode

➤ **To delete an observer mode:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 above).
3. In the Observer Mode list, select the observer mode that you want to delete.
4. Click the Delete button (−).

2.4.3 Editing an Observer Mode

➤ **To edit an observer mode:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on the previous page).
3. In the Observer Mode list, select the observer mode that you want to edit.
4. Edit the attributes of the observer mode as desired.

2.4.4 Renaming an Observer Mode

➤ **To rename an observer mode:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on the previous page).
3. In the Observer Mode list, select the observer mode that you want to rename.
4. Click the Rename button ( ). The Rename Observer Mode dialog box opens.
5. Type the new name.
6. Click OK.

2.5. Adding an Observer

You can add and remove observers. Having multiple observers lets you assign different observers to different windows or channels. Changing the position and orientation of the observer in one channel does not affect the view of a different observer in a different channel.

> ⓘ If you have multiple observers, the observer listed in the Observer Settings Toolbar is the observer assigned to the window that has focus. If you open the Display Engine Configuration Editor Panel and select a different observer in the Channel Attributes list, the data in relevant panels will change to reflect the values for the selected observer. However, as soon as you return focus to a window, the observer selection will change to match that of the window.

You can add observers in the Display Engine Configuration Editor Panel or on the Observer Settings page.

If you want to save your observers, save the display engine configuration in which you created them. (Saving an observer just saves its name. It does not save any information about a particular observer mode or location that you may have used for that observer. To save location information, save an observer view.)

2.5.1 Adding an Observer on the Observer Settings Page

➤ **To add an observer on the Observer Settings page:**

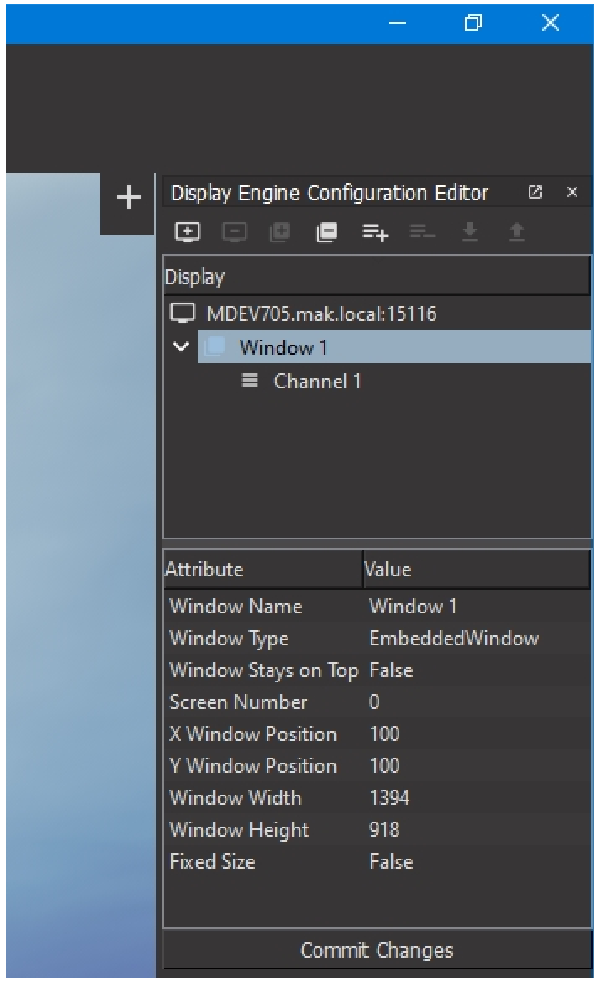
1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. Click the Add button (+) to the right of the Observer list. The Create New Observer dialog box opens.
4. Type a name for the new observer.
5. Click OK. The new observer is added to the list.
6. To save the observer, save the display configuration. (Saving the observer settings does not save observers. For information saving a display configuration, see "Saving a Display Engine Configuration".)

2.5.2 Adding an Observer in the Display Engine Configuration Editor

➤ **To add an observer on the Display Engine Configuration Editor Panel:**

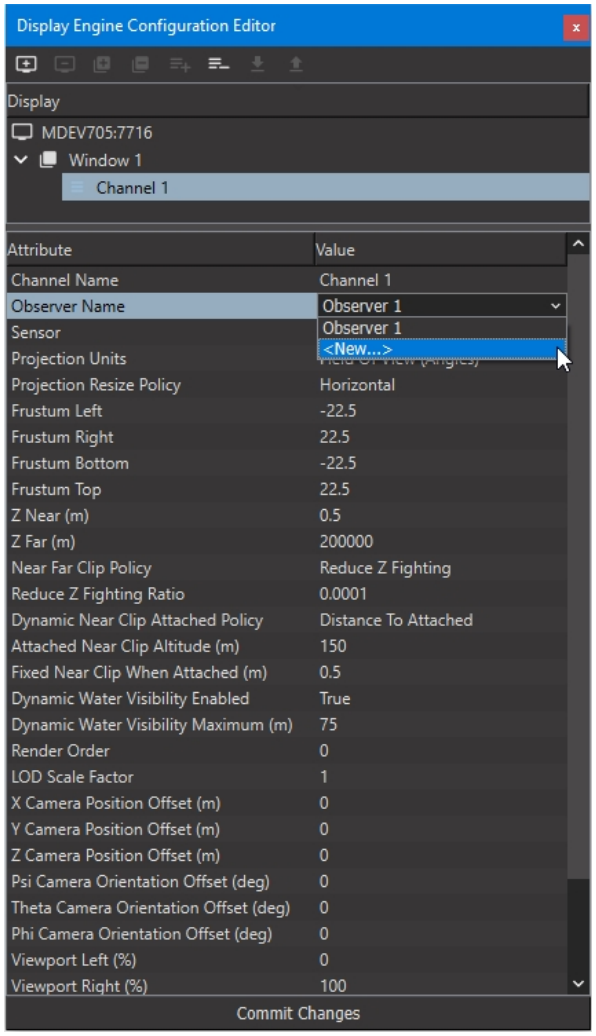
1. Choose **View > Display Engine Configuration Editor Panel**. The Display Engine Configuration Editor Panel opens (Figure 4).

Figure 4. Display Engine Configuration Editor Panel



2. Select the channel on which you want to add an observer.
3. Click the Value field for the Observer Name attribute to make it editable.
4. In the list, select New (Figure 5).

Figure 5. Observer Name attribute



5. Click Commit Changes. The Add Observer dialog box opens.
6. Type a name for the new observer.
7. Click OK. The new observer becomes the selected observer on the Observer Settings Toolbar, and is listed in the Observer Name attribute. (You may need to refresh the channel attributes before the observer name is listed.)
8. To save the observer, save the display configuration. (For information about saving a display configuration, see "Saving a Display Engine Configuration".)

2.6. Removing an Observer

When you close VR-Forces, all observers are removed. They are not saved unless you save a display configuration. You can also remove observers during a session.

➤ **To remove an observer:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).

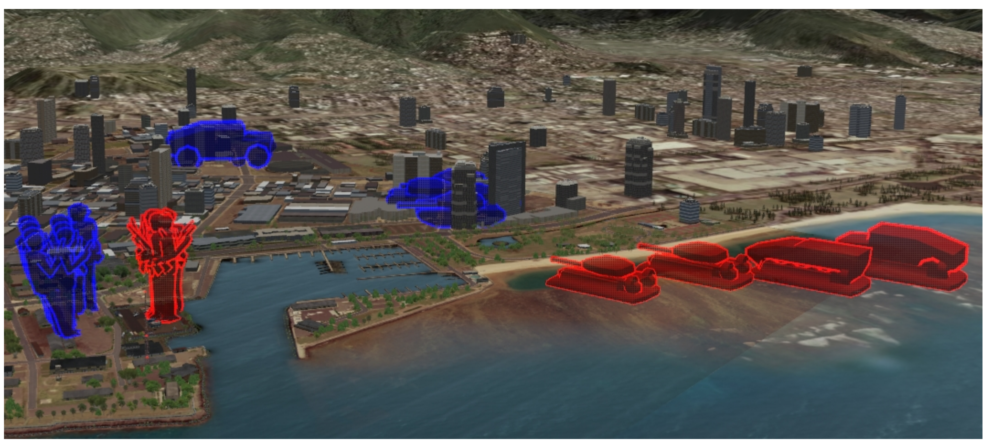
3. In the Observer list, select the observer that you want to remove.
4. Click the Delete button (—). The observer is removed.
5. If the observer was saved as part of a display configuration, save the updated display configuration.

2.7. Introduction to XR Mode

The Stealth observer mode (3D projection and 3D model set) provides situational awareness at the entity or small unit level. It is not ideal for getting the big picture of a simulation, because when you move the observer out to see large areas of terrain, the entity models, which are scaled to the terrain, are too small to see. The Plan View observer mode provides the big picture of a simulation, but does not provide situational awareness.

XR observer mode bridges the gap between the Stealth and Plan View observer modes. It is a 3D mode, so it provides situational awareness. However, it uses a special model set that makes models visible at greater distances than in Stealth observer mode. The 3D colorized model set shows entities as notional models using force coloring, which helps them stand out from the terrain. It also scales the model size to provided an exaggerated reality (hence XR). (You can also scale the regular 3D model set if you want to.) Figure 6 illustrates model scaling with 3D colorized models.

Figure 6. Model scaling and colorized models



For details about scaling models, see "Exaggerating the Scale of 3D Entity Models".

2.8. Model Sets

VR-Forces includes these model sets:

- 3D Models. Realistic, 3D, textured models with articulated parts.
- 3D Colorized Models. 3D model caricatures with minimal articulation. These models do not have textures, they are solid colors, by force. You can change the coloring between primary colors and MIL-STD icon colors.
- 2D icons. MIL-STD 2525B icons.

You can use any of the model sets in both 3D and 2D views. In the 2D view, the 3D models can only be viewed from the top.

2.8.1 Changing the Model Set

Each observer mode specifies a model set. You can change the model set associated with an observer mode by editing it (for details, see "2.4.3 Editing an Observer Mode" on page 7), but you can also dynamically change the model set being used.

➤ To change the model set, choose **Observer > Set Model Set > *model_set***, where *model_set* is one of the options on the menu.

2.9. Communicating Information About the Observer

VR-Forces can transmit state updates describing the observer's position and orientation, and can respond to view control messages sent by other applications.

2.9.1 Making the Observer Visible to Other Applications

By default, VR-Forces does not send state update messages to make its state information known to other applications. When you publish observer information, a plan view display can represent VR-Forces as an icon, or one VR-Forces application can synchronize its observer movement with that of another VR-Forces application.

➤ To enable or disable broadcasting of observer information, choose **Settings > Publish Observers** (or **Stop Publishing Observers**).

Making the Observer Visible to Only One Application (DIS Only)

In DIS you can send observer information to just one other application, rather than to everyone in the exercise. To do this, on the Simulation Connections Configuration dialog box, instead of using a broadcast address, set the destination address to the address of a specific computer.

2.9.2 Viewing and Attaching to Other Observers

If an exercise includes other stealth applications and they are sending state updates, VR-Forces can detect them. A remote observer entity is listed in the object hierarchy, so you can attach the local observer to it just as you would attach to any other simulation object.

Observer icons are displayed in the 2D view, but they are not normally visible in the 3D view, even when they appear in the entity list. If you want to display visual representations of remote observers, map a visual model to the observer's entity enumeration.

For related information, see "2.10. Displaying Models for Remote Observers" below.

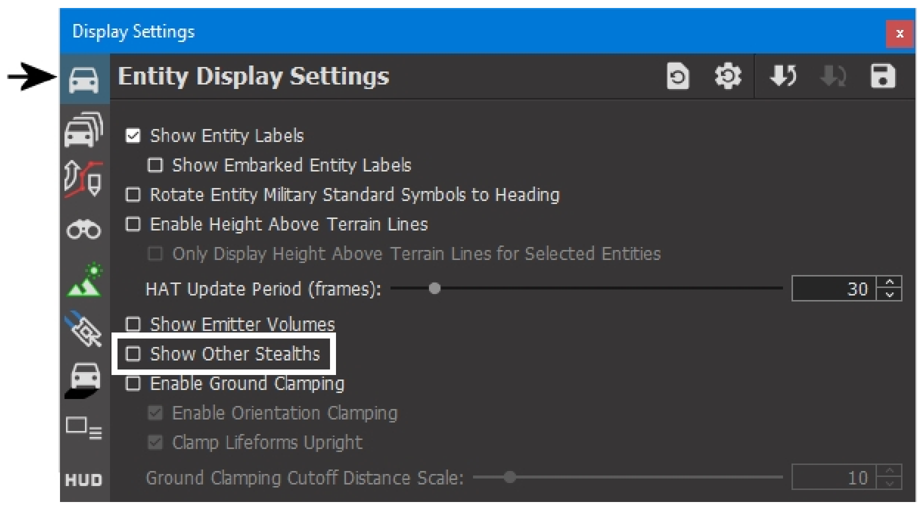
2.10. Displaying Models for Remote Observers

VR-Forces broadcasts the location and orientation of the observer. By default, it does not display a model for the observer. However, if there are other applications in an exercise that are broadcasting a stealth PDU (such as another VR-Forces application), you might want to represent them with a model.

➤ **To display a model for remote observers:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Entity Display Settings page (Figure 7).

Figure 7. Display Settings, Entity Display Settings page



3. Select the Show Other Stealths check box.

3. Moving the Observer

This chapter explains how to move the observer (eyepoint) in the VR-Forces window.

3.1. Moving the Observer

When you view a simulation, you usually want to move the observer (eyepoint) to different locations to view the terrain and scene elements being simulated. In VR-Forces, you can move the observer using the keyboard and the mouse. There are two basic contexts in which you can move the observer:

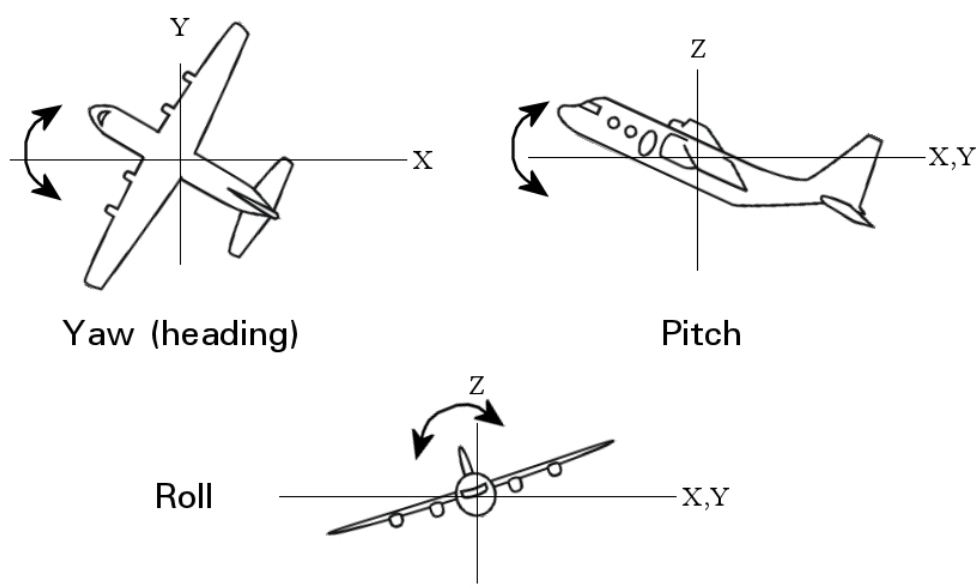
- You can move it independently of any scene element. This is called absolute, or free-fly mode.
- You can attach the observer to a simulation object, in which case it moves with the object. (You can also attach the observer to a prop. For details about attaching the observer to a simulation object or prop, see "Chapter 4. Attaching the Observer to Objects" on page 47.)

Absolute mode and the various attachment types are collectively called attach modes.

Regardless of which attach mode you are using, you can change the position and orientation of the observer. In the 3D view, position is defined by X, Y, and Z coordinates that identify its location in the 3D world. Orientation describes the observer's yaw (heading), pitch, and roll (Figure 8).

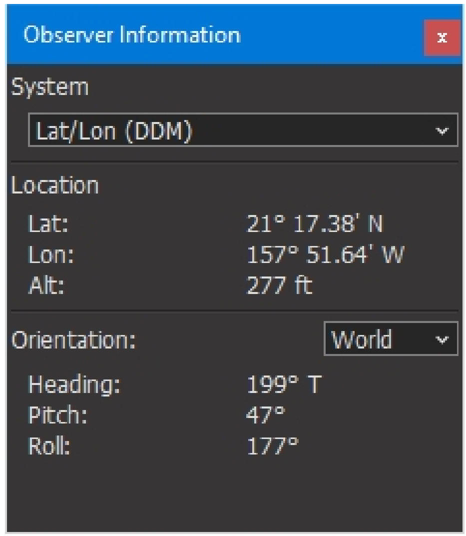
In the 2D view, the Z coordinate is fixed. You can change the X and Y coordinates. You can change the observer's yaw, but pitch and roll are fixed.

Figure 8. Orientation



The Observer Information Panel (Figure 9) displays the location and orientation of the observer in whichever coordinate system you select.

Figure 9. Observer Information Panel



3.1.1 Using the Compass to View the Observer’s Heading

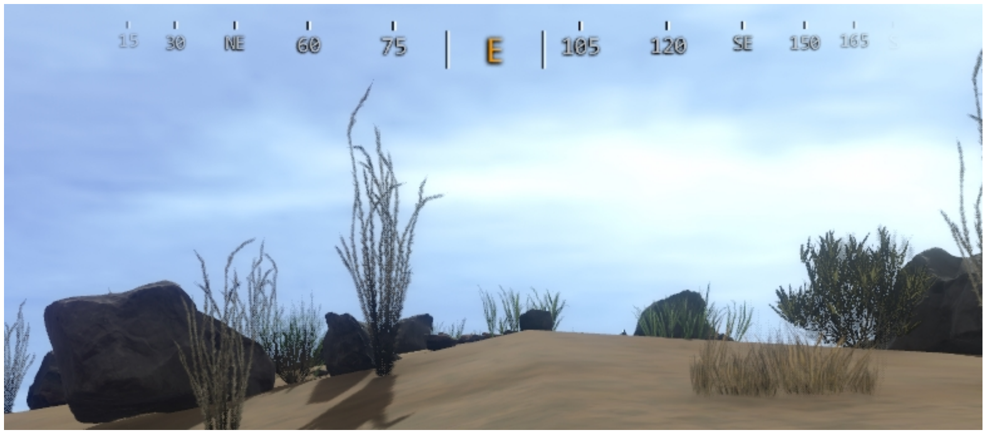
VR-Forces can display a compass that always shows the heading of the observer when a terrain is loaded. The compass is an observer mode setting. In Figure 11, the observer's heading is east.

In the 2D view, the compass has two needles. The straight needle indicates true north and the arrow needle indicates magnetic north. Depending on where the observer is in the world, the needles may be close together or wide apart.

Figure 10. 2D Compass

In the 3D view, the compass is horizontal and shows the direction where the observer is looking. This uses either true or magnetic north, based on the Heading specified in the Display Units Settings. You can also specify whether the 3D compass should use degrees or NATO-MIL. See "Specifying Display Units".

Figure 11. 3D Compass



➤ **To enable or disable the compass:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. Select the observer mode for which you want to change the compass setting.
4. In the list of observer settings, select or clear Compass.

> You can also enable or disable the compass by choosing **Observer > Compass**.

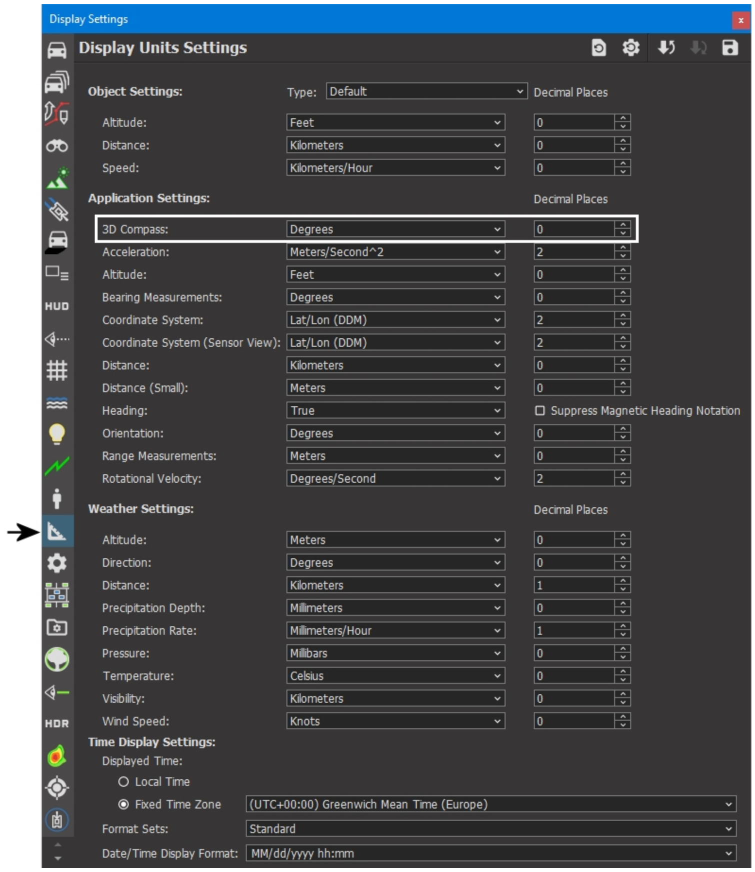
3.1.2 Setting the Compass to Degrees or MILs

In the Display Units Settings, you can specify the measurement units for the 3D compass: degrees or NATO-MIL.

➤ **To specify the measurement units for the 3D compass:**

1. Choose **Settings > Display**.
2. Select the Display Unit Settings page.
3. From the 3D Compass list, choose the measurement you want to use.

Figure 12. 3D Compass Settings



> When you use the 3D compass, the default behavior is for it to show the cardinal and intercardinal direction indicators (N, NE, S, SW, and so on). You can change the definition such that they do not display as the current heading. (They continue to display on other parts of the compass.)
>
> If you want to change the setting, edit the 3dViewCompass model definition (in the Channel3dViewCompass schema) and set the parameter isExactHeadingAlwaysShown to true. For more information, see the Model Definitions chapter of the *Adding Content to MAK ONE Applications Reference Manual*.

3.1.3 Editing the Compass's Attributes

You can configure the compass by editing its schema (ChannelCompass) and model definition (smallCompass and largeCompass). (For details about editing schemas, see "Creating and Editing Schemas" in the *Adding Content to MAK ONE Applications Reference Manual*. For details about editing model definitions, see "Creating and Editing Model Definitions" in the *Adding Content to MAK ONE Applications Reference Manual*.)

By default, all channels have the largeCompass keyword. To change the style of compass used for a channel, change the keyword in the Keywords attribute for the channel. To completely remove the compass, delete the keyword. For details about setting channel attributes, see "Changing a Channel's Attributes".

You can change where the compass is displayed in the window by editing the location attribute. The permissible values are top, topRight, right, bottomRight, bottom, bottomLeft, left, and topLeft.

You can change the color of the compass by editing the darkTickColor and lightTickColor attributes. The color is defined using the OpenGL scheme for specifying RGBA. The first three values are the RGB color values. The fourth value specifies opacity. Each value can be from 0.0 through 1.0.

3.2. Observer Movement Functions and Keyboard Mappings

When you move the observer, you are executing observer movement functions. An observer movement function is a specific way that the observer can move, such as Move Observer Forward or Move Level Observer Forward. (These functions both move the observer forward, but they use different observer coordinate systems. Observer movement coordinate systems are described in "3.2.1 3D Observer Movement Coordinate Systems" below.)

The various movement functions are mapped to the keys on the keyboard and to mouse buttons and the mouse wheel. If you use the default key mappings for the default observer modes, then most of the time, the observer will behave exactly as you would expect it to. However for some types of movement, such as forward and back, the observer can move differently depending on the view, the observer coordinate system, or the attach mode. Therefore, VR-Forces provides several key mappings that let you choose which type of observer movement to use. You can change these key mappings and create your own key mappings. (For details about editing key maps, see "Creating and Editing Key Mappings".) This section describes how observer movement can vary based on the observer coordinate system and the attach mode.

Table 1 lists the observer modes and key map settings provided with VR-Forces applications.

Table 1. Observer modes

Observer Mode	Projection	Key Map
Stealth	3D	Observer Frame
CameraFX modes	3D	Observer Frame
XR	3D	Observer Frame
Plan View	2D	2D Level Observer Frame
The observer modes all support the three model sets: 3D models, 3D colorized models, and 2D icons.		

3.2.1 3D Observer Movement Coordinate Systems

In the 3D view, the observer moves in the context of one of the following coordinate systems:

- Level Observer Coordinates: Movement is with respect to the terrain. The level observer coordinate system is defined by the current up vector (Z), and a plane normal to that vector into which the observer's X and Y axes are projected. (Essentially, this means that the observer's heading is used while its pitch and roll are considered to be 0.0.)

> ⓘ Movement is always with respect to a plane tangent to the earth's surface. However, in a projected terrain database, such as UTM, Lambert Conformal Conic, or flat earth, the plane is fixed, whereas in a geocentric terrain database the up vector (and hence the tangent plan) changes as the observer's position changes, so movement follows the curvature of the earth.

- Observer Coordinates: Movement is with respect to the observer's body coordinate system.
- Entity Level Body Frame Coordinates: Movement is with respect to an entity's body frame, but ignores pitch and roll.
- Entity Body Frame Coordinates: Movement is with respect to an entity's body frame, including pitch and roll.

The practical difference between observer coordinates and level observer coordinates is that in level observer coordinates, if you are looking down at the terrain, when you move forward and backward, you fly over the terrain, looking down. In observer coordinates, when you move forward and backward, you move down towards the terrain or away from it at whatever angle you are oriented towards it.

3.2.2 2D Observer Coordinate System

When you use the 2D view in VR-Forces, the observer uses a variation of level observer coordinates. Movement is restricted to two dimensions, so there are no movement functions for changing the altitude, pitch, or roll. You can zoom in and out in the 2D view, but this does not change the observer's altitude, it changes the field of view and resolution of the terrain image.

3.2.3 The Attached Context and Observer Movement (3D Only)

The key maps control navigation using a particular coordinate system (observer frame or level observer frame). They also support navigation in alternate coordinate systems. The alternate system varies depending on the attached context of the observer. It represents MAK's opinion of which alternate coordinate system would be most useful given the attach mode that the observer is using.

The Move Attached Context *direction* (forward, back, up, down, left, right) functions move the observer in the context of its attach mode. Movement is modified by attach modes:

- Follow mode: movement is in the entity's level body frame.
- Track mode: movement is in the entity's level body frame.
- Mimic mode: movement is in the entity's body frame.
- Tether mode: movement is in level observer frame.
- Unattached: movement is in level observer coordinates.

Figure 13 and Figure 14 illustrate the differences between moving the observer in an attached context and without an attached context.

Figure 13 illustrates movement in entity level body coordinates (Follow and Track modes). The Move Observer Left function (**A** in Observer Frame key map) moves the observer to the left in observer coordinates, that is left relative to the observer's heading. The Move Attached Context Left function (**Shift+A**) moves the observer left in the attached context. In entity level body frame, this means the observer moves left relative to the entity's heading.

Figure 13. Observer movement in entity level body frame coordinates

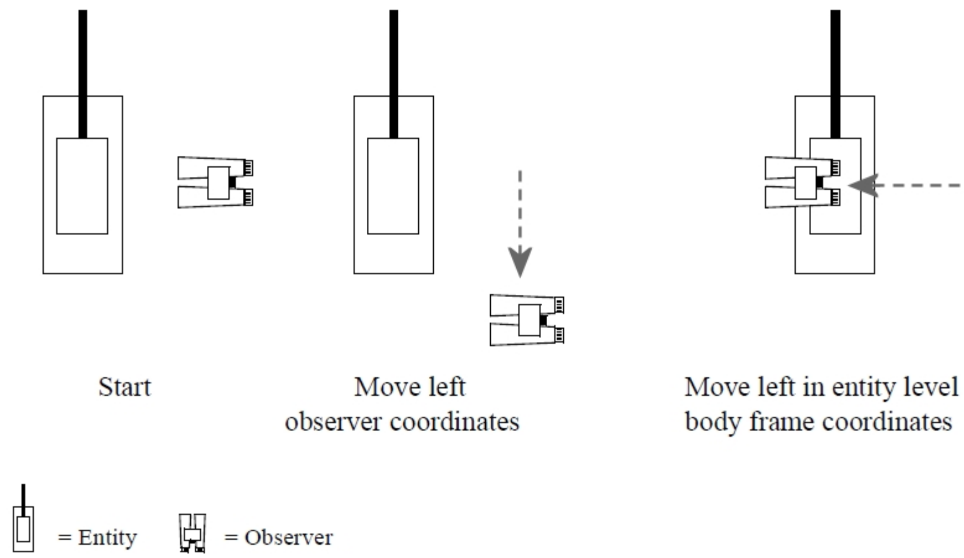
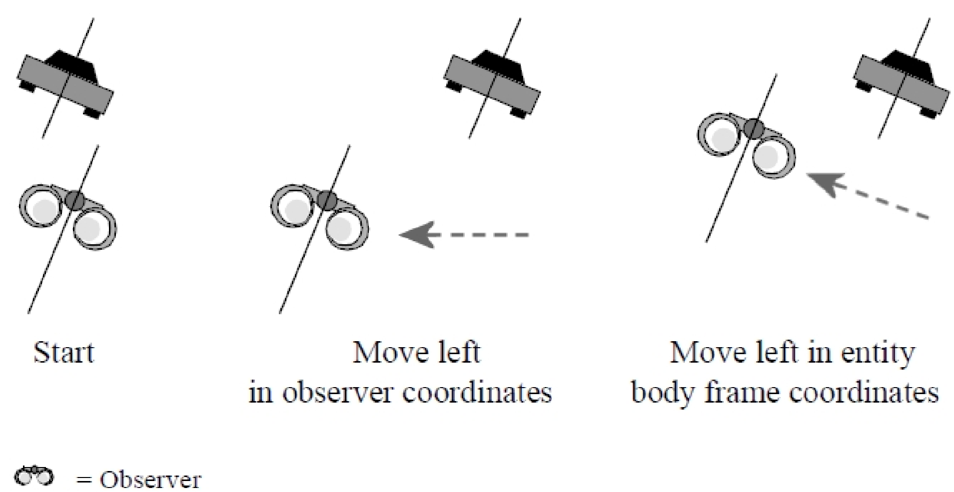


Figure 14 illustrates movement in entity body frame (Mimic mode). The Move Observer Left function moves the observer to the left in observer coordinates, that is left relative to the observer's heading, but ignoring pitch and roll. The Move Attached Context Left function moves the observer left in the attached context. In entity body frame, this means the observer moves left relative to the entity's heading and its pitch and roll.

Figure 14. Movement in entity body frame coordinates



3.3. Moving the Observer from the Keyboard in the 3D View

VR-Forces maps the observer movement functions to the keyboard using key maps that support the most typical ways that users want to move through the 3D world, either in absolute mode or attached to a simulation object.

> ⚠ References to movement key combinations use the key mappings provided with VR-Forces. If you change these key mappings, the instructions may no longer be valid.

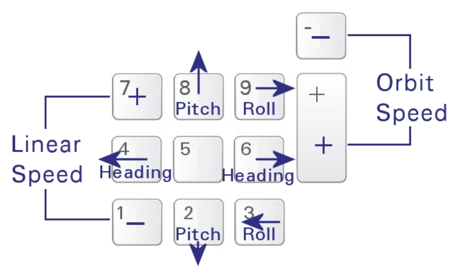
As described in "3.1. Moving the Observer" on page 17, the observer typically moves with respect to the terrain in level observer coordinates or observer coordinates. The corresponding key maps are Level Observer Frame and Observer Frame.

Figure 15 illustrates the positional movement keys. Figure 16 illustrates the keypad layout for changing orientation and movement speed. For a complete list of movement functions and their keyboard and mouse mappings, see the VR-Forces Quick Reference Card or the Key Mapping Editor.

> ⚠ To use the keypad for navigation, NumLock must be on.

Figure 15. Primary movement keys, observer coordinates (3D)

Figure 16. Keypad layout, heading, pitch, and roll (3D)



> ⓘ If your keyboard does not have a keypad, as on most laptops, the Laptop key map lets you use the arrow keys to control the left, right, up, and down movement mapped to 4, 6, 8, and 2 on keypads.

➤ To move the observer, press a key combination and hold it for as long as you want the observer to keep moving.

> ⓘ You can press more than one key at a time to combine movement functions. For example, pressing the move forward and move left keys at the same time moves the observer diagonally left and forward.

3.3.1 Navigation Options

This section lists the different ways that you can move the observer using the keyboard. For a complete list of movement functions and their keyboard and mouse mappings, see the VR-Forces Quick Reference Card. You can:

- Move forward and backward (observer, level observer, entity, level entity, and attached context coordinates).
- Move up and down (observer, level observer, entity, level entity, and attached context coordinates).
- Move left and right (observer, level observer, entity, level entity, and attached context coordinates).
- Rotate (heading) left and right (observer and level observer coordinates).
- Rotate (pitch) up and down (observer and level observer coordinates).
- Rotate (roll) left and right (observer and level observer coordinates).
- Orbit left and right.
- Orbit up and down.
- Look (move camera) left and right.
- Look (move camera) up and down.
- Tilt (move camera) left and right.
- Reset the observer to the default position and orientation for the attached mode.
- Reset the camera to the default position and orientation.
- Zoom the view.

For details about orbiting, see "3.3.2 Orbiting" below. For details about moving the camera, see "3.3.3 Moving the Camera" on the next page.

ⓘ When you view a geocentric terrain and move the observer more than 6 million meters away from the earth's surface, the view is forced to focus toward the center of the earth. The practical effect of this mode is that the left and right movement keys orbit the eyepoint around the earth, rather than moving the entire earth to the left or right.

3.3.2 Orbiting

You can orbit the observer (revolve left, right, up, and down) around an object or the point on the terrain that is at the center of the window. (If the center of the screen is in the sky, orbit does not work.) When you orbit, the observer's heading continuously changes so that it always faces the point or object around which it orbits. You can change the camera to look at something other than the orbit point while you are orbiting.

➤ **To orbit around an object:**

1. Attach the observer to the object.
2. Press the right or left arrow keys.

➤ **To orbit around a point:**

1. If you are attached to a simulation object, detach (press **Z**).
2. Press the right or left arrow keys.

3.3.3 Moving the Camera

By default, the observer always looks in the same direction as its heading. However, just as the turret on a tank can swivel and fire in directions other than its body's heading, the observer can look in a direction other than its heading. The ability to look around is enabled in the camera. You can move the observer's camera up, down, left, right, tilt left, and tilt right. (The default key mappings are **Ctrl**+*Keypad number*, where *number* is 2, 3, 4, 6, 8, or 9.)

To use the keypad for navigation, **NumLock** must be on.

You can tell that the camera is moving, but the heading is not, by observing the compass. If you change the heading, the view of the terrain changes and the compass moves. If you move the camera, but keep the heading static, the view of the terrain changes, but the compass does not move.

➤ To move the camera, press the keys mapped to the camera movement functions.

3.4. Moving the Observer Using the Mouse (3D View)

You can change the observer's position and orientation with the mouse. (To see the full list of mouse mappings, view the Mouse Settings page on the Application Settings dialog box.)

Using the mouse, you can:

- Drag the terrain
- Drag the view
- Orbit the terrain
- Change orientation
- Teleport (jump)

3.4.1 Dragging the Terrain

Dragging the terrain combines the move forward, backward, left, and right functions.

➤ **To drag the terrain:**

1. Click a point on the terrain and hold down the left mouse button.
2. Drag the mouse left, right, forward, and backward.

Dragging the terrain is most effective when you are moving large distances, such as several kilometers. To move small distances, use the keyboard.

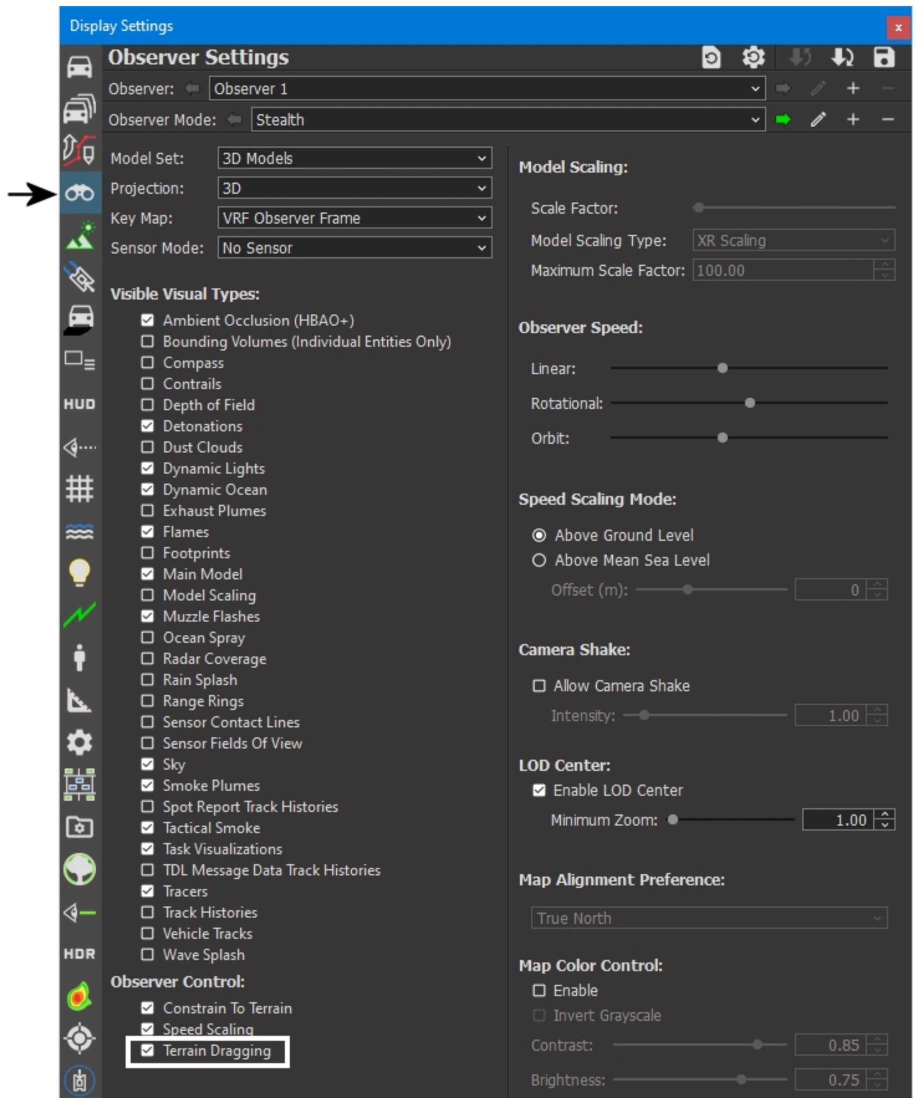
Disabling Terrain Dragging

There may be times when you want to disable terrain dragging. This may be particularly useful when you are creating simulation objects or objects or editing them and do not want to inadvertently drag the terrain when you are trying to move objects.

➤ **To enable or disable terrain dragging:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 17).

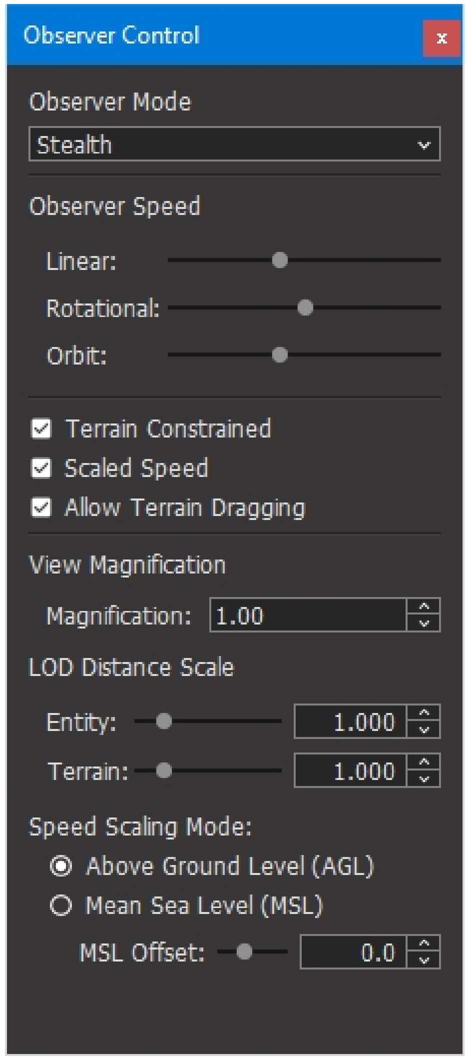
Figure 17. Observer Settings page



3. Select or clear the Terrain Dragging check box.

> ⓘ You can also enable or disable terrain dragging by clearing the Allow Terrain Dragging check box on the Observer Control Panel (Figure 18).

Figure 18. Observer Control Panel



3.4.2 Changing the Observer's Orientation with the Mouse

➤ To change the observer's orientation, hold down the right mouse button and drag the mouse. The observer rotates in the direction you drag the mouse.

3.4.3 Dragging the View

Dragging the view combines the observer up, down, left, and right movement functions. Unlike dragging the terrain, which requires you to click a point on the terrain, you can drag the view from any observer location.

➤ To drag the view, hold down the middle mouse button (or wheel) and drag the mouse.

3.4.4 Orbiting the Terrain with the Mouse

➤ To orbit the terrain with the mouse, press **Ctrl** and drag the mouse.

3.4.5 Teleporting the Observer

You can teleport the observer to a simulation object, a prop, or a place on the terrain. Teleporting moves the observer 90% of the way from its current position to the location or object clicked on.

➤ **To teleport the observer:**

- **Shift**+click on the terrain or prop that you want to jump to.

  > ⓘ If you **Shift**+click on a filled area, the observer attaches to the area; it does not teleport. If you want to teleport to the terrain under an area, hide the area first. You can hide an area by hiding all tactical graphics or hiding the overlay on which the area is located.

- **Ctrl**+**Shift**+click on the simulation object that you want to jump to.

3.5. Moving the Observer in the 2D View

In the 2D view, you move the observer using the mouse and keyboard just as you do in the 3D view. Many of the key and button mappings for the 2D view are the same as those in the 3D view. However, the 2D mappings do not support movement that is not meaningful in two dimensions, such as up and down (altitude), pitch, and roll.

> ⓘ When Orient North is enabled, you cannot change the heading of the observer. For information about Orient North, see "3.9. Forcing Orientation North" on page 37.

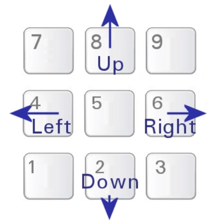
3.5.1 Moving the Observer from the Keyboard in the 2D View

Figure 19 illustrates the positional movement keys for the 2D view. Figure 20 illustrates the keypad layout for changing heading and movement speed. For a complete list of movement functions and their keyboard and mouse mappings, see the [VR-Forces Quick Reference Card].

> ⚠ To use the keypad for navigation, **NumLock** must be on.

Figure 19. Primary movement keys, observer coordinates (2D)

Figure 20. Keypad movement (2D)



3.5.2 Moving the Observer Using the Mouse in the 2D View

You can change the observer's position and heading with the mouse. You can change the observer's position by dragging the terrain, as described in "3.4.1 Dragging the Terrain" on page 26. You can change heading by orbiting, as described in the next section. (To see the full list of mouse mappings, view the Mouse Settings page on the Application Settings dialog box.)

Orbiting the Terrain with the Mouse

When Orient North is enabled, you cannot orbit. For information about Orient North, see "3.9. Forcing Orientation North" on page 37.

➤ To orbit the terrain with the mouse, press the right mouse button and drag the mouse.

3.6. Zooming the Observer

You can zoom the observer in the 3D and 2D projections. Although the apparent effect is similar for top-down views, they are conceptually and behaviorally different. In addition to a straight "in-and-out" zoom, you can zoom the view to the extents of a simulation object or group of simulation objects.

3.6.1 Zooming the Observer in the 3D Projection

If you want to see something at a higher level of detail (LOD) without moving the observer, you can adjust the view magnification (zoom) of the observer view. Zooming the observer magnifies objects in the view, increasing the LOD to match the level of zoom. The magnification level is saved in saved views. 3D zoom has these characteristics:

- When you zoom the observer view, its movement and mouse look speeds decrease as the magnification increases, to allow for increased control.
- The channel's (window's) field of view establishes the baseline 1X zoom level. Changing the field of view does not change the effective magnification (that is, it does not change the LOD).
- When you switch from 3D to 2D (Stealth only), VR-Forces calculates a 2D zoom level to match the 3D view. If you then switch back to 3D, it remembers the observer location and zoom level.
- If you zoom in from a very high altitude there may be scene corruption due to insufficient precision in the z-buffer. This can be limited by moving the observer closer to the subject before zooming in. This issue is typically only encountered

above 10,000 meters.

- When you zoom, VR-Forces respects the environmental conditions at the observer's location. For example, if the observer is above the cloud layer, zooming does not let you see below the clouds. Or, if it is raining at the observer's location, the visibility will not improve as you zoom in on a distant object.
- After zooming in, when you zoom out, you can only zoom out to magnification level 1. That is, you can only zoom out back to the observer's location. To see more of the terrain, move the observer away from the terrain.

➤ To zoom in, press the **=** key, press **Ctrl** and scroll the mouse wheel forward, or on the Observer Control Panel specify a value in the Magnification box.

➤ To zoom out, press the **-** (dash) key, press **Ctrl** and scroll the mouse wheel backward, or on the Observer Control Panel specify a value in the Magnification box.

> ⓘ Each press of the **=** or **-** key, or increment of the mouse wheel, increases or decreases magnification by a factor of 1.25.

➤ To reset magnification to 1.0, press zero (**0**) or press the middle mouse button.

3.6.2 Zooming the Observer in the 2D Projection

In the 2D projection you can zoom the observer view closer to and away from the terrain. However, unlike in 3D, in which you cannot zoom out past the location of the observer, there is essentially no limit on zooming in and out because in 2D, the observer does not actually have altitude.

➤ To zoom in, press **E**, or to step the zoom, press the **=** key.

➤ To zoom out, press **Q**, or to step the zoom, press the **-** (dash) key.

➤ To zoom with the mouse wheel, scroll forward to zoom in on the spot under the mouse cursor, or backward to zoom out. Hold down the **Alt** key and scroll forward to zoom in on the spot at the center of the screen.

➤ To reset the observer to the default zoom level, press the **Spacebar**.

3.6.3 Setting the Scale Factor for Terrain

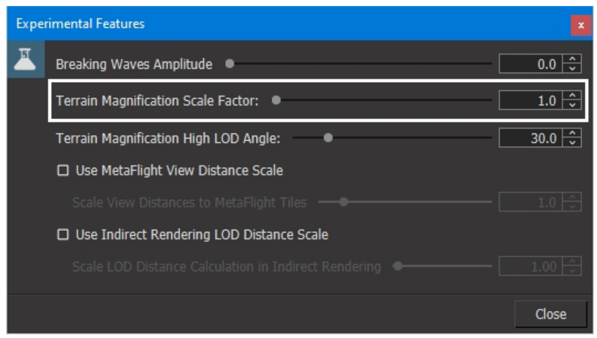
When you zoom the view, all distances used for determining LODs (including terrain) are scaled by the view magnification. In some cases, this is more aggressive than desired for the terrain. To remedy this problem, you can change the amount by which the terrain distance is scaled relative to the view magnification. For example, if view magnification is 8.0 and the Terrain Magnification Scale Factor is 2.0, then the distance used for paging would be scaled by 4.0 (8.0/2.0) rather than by the full factor of 8.0.

Some 3D terrains are not designed to be viewed at higher magnification. Performance may decrease if magnification increases the level of detail of large areas of the terrain. For example, suppose you are looking down a row of trees that is in the center of the view. At normal magnification, there are a certain number of trees at each quality level, say 10 high, 20 medium, and 100 low (for a total of 130 trees in the row). Suppose also that performance will be acceptable only when visualizing 15 or fewer high quality trees. If you magnify the scene 2x, you may now see 20 high, 40 medium, and 70 low quality trees. You see the same number of trees, but performance will decrease because you are visualizing more high quality models.

➤ **To set the scale factor for terrain:**

1. Choose **Settings > Experimental Features**. The Experimental Features dialog box opens (Figure 21).
2. Adjust the Terrain Magnification Scale Factor slider.

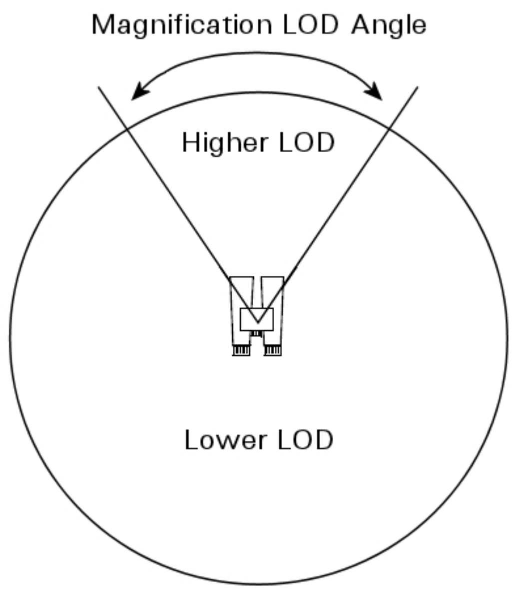
Figure 21. Experimental Features



3.6.4 Setting the Magnification LOD Angle for Terrains

When the observer zooms in, VR-Forces pages in higher LOD tiles for the terrain. This increases memory usage. You can tune performance by restricting high LOD tiles to the areas you are interested in and using lower LOD tiles for the rest of the terrain. The Terrain Magnification High LOD Angle setting lets you adjust the angle within which higher LOD tiles are used (Figure 22).

Figure 22. Terrain magnification LOD angle



If you want the observer to be able to quickly scan a wide angle of terrain, you should increase the magnification LOD angle or you may have to wait for high LOD tiles to page in as you move the observer.

On some terrains, when high LOD tiles are adjacent to low LOD tiles, there can be cracks in the terrain along the boundaries. If you experience this problem, increase the magnification LOD angle.

This feature has a purpose similar to that of LOD centering (described in "3.6.7 Configuring the LOD Center in the Observer Mode" on page 35). This feature is best used for ground vehicles. We recommend LOD centering for use with aircraft.

This setting is saved when you close VR-Forces.

➤ **To set the magnification LOD angle for terrain:**

1. Choose **Settings > Experimental Features**. The Experimental Features dialog box opens (Figure 21 on the previous page).
2. Adjust the Terrain Magnification High LOD Angle slider.

3.6.5 Zooming In to the Ocean Over Long Distances

When you zoom the observer view to the ocean over very long distances, the ocean might not render at the correct altitude and ships can be hidden (beneath the rendered ocean). The ocean can also interact poorly with the terrain.

If you experience this problem, edit *./data/Environment/Ocean/Triton.config* and set `use-mesh = no`.

If making this change causes performance to decrease, adjust these settings in the file to improve performance:

```
prop-wash-default-fade-time = 60.0
wake-wash-length = 1000
wake-wave-generation-distance = 1.0
wake-kelvin-wave-min-amplitude = 0.1
```

3.6.6 Zooming to Extents

You can zoom the observer to the extents of the terrain or selected simulation objects. When you zoom to extents:

- If no simulation objects are selected and the observer is not attached to a simulation object, the observer view resets to the terrain center. This is the same behavior as pressing **Spacebar**.
- If the observer is attached to a simulation object, the observer resets to the default attached view. This is the same behavior as pressing **Spacebar**.
- If simulation objects are selected and the observer is not attached to a simulation object, the observer view redisplays to show the extents of the selected simulation objects. In the 3D view, this is a top-down view.

Zooming the Observer to the Extents of Selected Simulation Objects

You can quickly change the observer view to show the extents of a selected simulation object or simulation objects. In 2D the observer zooms to the extents. In 3D the observer moves to the correct altitude to view the extents of the simulation objects while looking down at them.

➤ **To zoom the observer to the extents of selected simulation objects:**

1. Select the simulation objects that you want to zoom in on. To zoom to the extents of all simulation objects, do not select any simulation objects.
2. Choose **View > Zoom to Extents**.

Zooming to Simulation Object Extents when a Scenario Loads

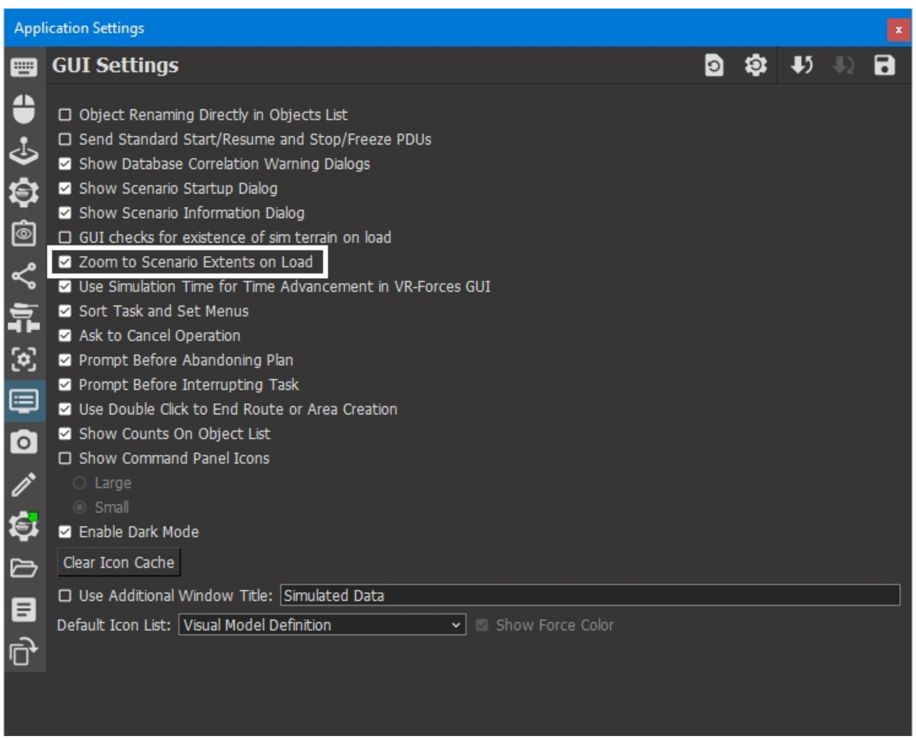
You can configure a scenario so that it zooms to the extents of all simulation objects when the scenario loads. This can be convenient when you have simulation objects located in one part of a large terrain.

> ⓘ If a scenario has a saved observer view that is designated as the initial view for the scenario, it overrides Zoom to Scenario Extents on Load.

➤ **To zoom to simulation object extents when a scenario loads:**

1. Open the scenario that you want to zoom to extents on load.
2. Choose **Settings > Application**. The Application Settings dialog box opens.
3. Select the GUI Settings page (Figure 23).

Figure 23. GUI Settings page



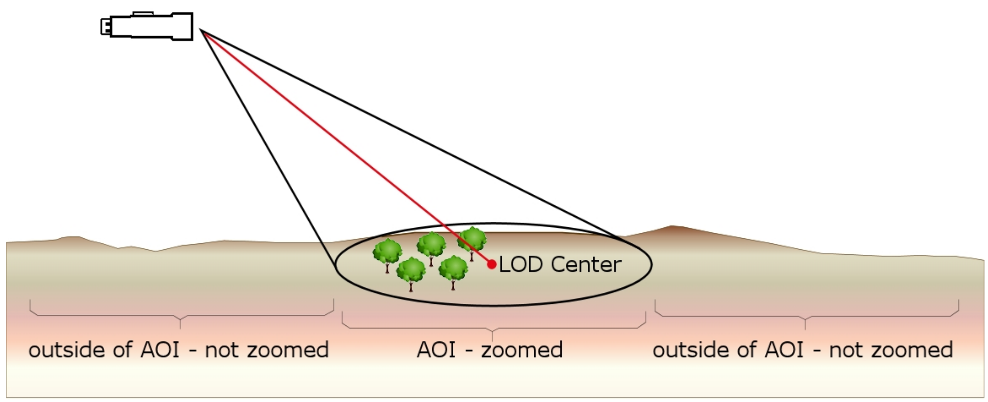
4. Select the Zoom to Scenario Extents on Load check box.
5. Save the scenario. The next time you load the scenario, if the Zoom to Scenario Extents on Load check box is selected, it zooms to the entity extents.

3.6.7 Configuring the LOD Center in the Observer Mode

When the magnification is greater than one, the default behavior is to perform a screen intersection on the area the observer is looking at and improve the LOD at that area and not in other areas. Some areas of the terrain between the observer and the point you have zoomed in on will have a lower LOD, so you might want to change the behavior.

Enabling the LOD center in the observer mode adjusts the LODs for the areas away from the area of interest (AOI) to be lower, which avoids paging or rendering higher LOD models that are not visible in the view. The LOD center uses an intersection with the view vector and the terrain to determine where the AOI is, as shown in (Figure 24).

Figure 24. LOD centering creates an area of interest where the view intersects the terrain



This feature has a purpose similar to that of changing the LOD angle (described in "3.6.4 Setting the Magnification LOD Angle for Terrains" on page 32). This feature is best used with aircraft. We recommend changing the LOD angle for use with ground vehicles.

➤ **To configure the LOD center in the observer mode:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. Select or clear the Enable LOD Center check box.
4. To use the LOD center starting at a specific zoom magnification, adjust the Minimum Zoom slider or enter a value in the box.
5. Click Close.

3.7. Centering the Observer on a Simulation Object

You can center the observer on a simulation object from the Object Console Summary Panel, the Last Clicked Object Panel, or the Information dialog box. If you center on a simulation object from the Object Console Summary Panel, the observer is attached to the object. It is not attached using the other methods.

3.7.1 Centering on an Object from the Object Console Summary Panel

If you see that there is a message in the Object Console Summary Panel regarding a simulation object, you may want to quickly view that object. The Object Console Summary Panel lets you center the view on a simulation object. When you center the observer view on a simulation object, the observer attaches to it in Tether mode. For details about Tether mode, see "4.2.7 Tether Mode" on page 55.

➤ **To center the observer on a simulation object:**

1. In the Object Console Summary Panel, right-click a message from the simulation object you want to center on. A menu displays.
2. Choose **Center Entity**.

3.7.2 Centering on an Object from an Information Panel

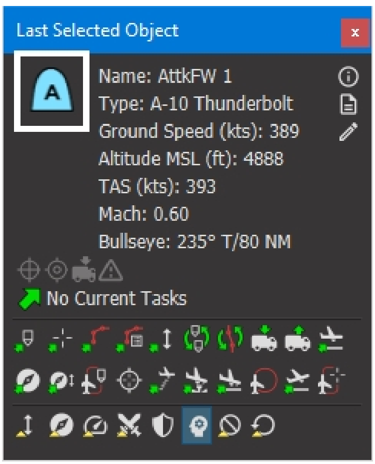
You can center the observer on a simulation object from the Last Clicked Object Panel or the Information dialog box. When you center the observer this way, it is not attached to the object. If the simulation object is moving, it moves away from the center of the display.

If you center on a simulation object in Plan View observer mode, the icon is centered in the window. If you center on a simulation object in Stealth observer mode, the observer stays in the current orientation relative to the centered object. If you press the **Spacebar**, the view changes to a top down view, similar to Plan View mode.

> ⓘ If the observer is attached to a simulation object, you cannot center the observer on a different object using this procedure.

➤ To center the observer on a simulation object from the Last Clicked Object Panel or the Information dialog box, click the simulation object icon on the panel (for example, Figure 25).

Figure 25. Simulation object icon



3.8. Simulating Camera Jitter

You can simulate the jitter that cameras attached to aircraft or unsteady human hands may experience.

➤ **To simulate camera jitter:**

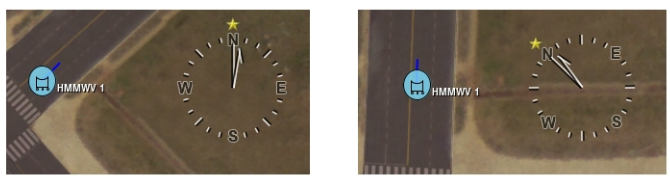
1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. In the Camera Shake section, select Allow Camera Shake.
4. Optionally, adjust the Intensity slider or change the value in the box.

3.9. Forcing Orientation North

In the 2D view, by default the observer's heading is forced to stay north (up), regardless of the heading of the simulation object to which it is attached. You can disable this setting, in which case if you attach to a simulation object, the view of the terrain rotates to match the heading of the attached simulation object.

Figure 26 illustrates the view when the observer is attached to an entity with orientation forced to north or matched to that of the entity.

Figure 26. Forcing orientation north



Orient north Orient to entity heading

➤ **To enable or disable a northward orientation:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. In the Observer Mode list, select Plan View.
4. In the list of observer settings, select or clear Orient North.
5. Optionally, you can define whether north is true or magnetic. See "3.9.1 Specifying True, Magnetic, or Grid North" below.

> ⓘ You can also enable or disable northward orientation by choosing **Observer > Orient North**.

3.9.1 Specifying True, Magnetic, or Grid North

When the observer is set to Orient North, you can specify which north to use for the plan view (2D). True north, also known as geodetic north, is the direction pointing to the geographic location of the North Pole. Magnetic north, on the other hand, is the point where the magnetic field points down. In VR-Forces, it is determined by the World

Magnetic Model (WMM). The current parameters are good until 2025. To learn more about the WMM, visit https://www.ngdc.noaa.gov/geomag/WMM. Lastly, grid north is the direction indicated by the vertical grid lines on ordnance survey maps.

➤ **To specify the type of north:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. In the Observer Mode list, select Plan View.
4. In the Map Alignment Preference list, select True North, Magnetic North, or Grid North.

3.10. Enabling and Disabling View Constraints (3D Only)

View constraints control how the observer behaves when it approaches solid objects in the view, such as the ground, buildings, and vegetation. When constraints are enabled, the observer has a 1 meter bounding sphere that prevents it from moving through terrain or props.

> ⓘ If view constraints are enabled, you may not be able to move the observer into buildings to view and place entities. Changing the near clipping plane or transparency will let you see through walls, but in constrained mode, you will still not be able to move the observer through the walls.

➤ **To enable or disable view constraints, use one of the following methods:**

- Press **/** (forward slash).
- Choose **Observer > Constrain to Terrain**.
- On the Observer Control Panel (Figure 18 on page 28), select or clear the Terrain Constrained check box.

3.11. Controlling Navigation Speed

When you navigate through the terrain, there are times you want to move quickly, covering large amounts of terrain, and times you want to move slowly, such as when you are moving down a street or within a building. VR-Forces has options for controlling navigation speed:

- Set the navigation speed manually. The observer always moves at the specified speed.
- Use speed scaling to automatically move at different speeds under different circumstances. You can change the rate at which speed is scaled.

In either case, the controls for changing speed are the same. Their effect varies depending on whether speed scaling is enabled.

3.11.1 Enabling or Disabling Speed Scaling

When speed scaling is enabled, VR-Forces makes the following assumptions:

- If the observer is unattached, the higher above the terrain it is, the faster you want to move.
- The closer you are to an attached object, the more slowly you want to move.

➤ **To enable or disable speed scaling, use any of the following methods:**

- On the Observer Control Panel (Figure 18 on page 28), select or clear the Scaled Speed check box.
- Choose **Observer > Speed Scaling**.
- Press the multiply key (*****) on the keypad (not the asterisk key).

Setting the Speed Scaling Mode

When speed scaling is enabled, VR-Forces scales observer speed based on the its height above the terrain. Even if the observer is higher than all terrain points, speed can still be affected if there are changes to the terrain, such as mountains. This can be annoying if it happens unexpectedly. Therefore, you can choose to base speed scaling on height above ground level, or height above mean sea level. In that latter case, changes to the terrain would not affect the speed at which the observer moves. If you set speed scaling to use height above mean sea level, you can specify an offset.

➤ **To set the speed scaling mode, use one of the following methods:**

- On the Observer Control Panel (Figure 18 on page 28), set the Speed Scaling Mode to Above Ground Level (AGL) or Above Mean Sea Level (MSL)
- On the Display Settings dialog box, Observer Settings page, set the Speed Scaling Mode to Above Ground Level (AGL) or Above Mean Sea Level (MSL)

3.11.2 Changing the Observer's Movement Speed

You can change the observer's linear, rotational, and orbital speed. If speed scaling is enabled, these controls change the speed gain. If speed scaling is disabled, the controls change the absolute speed.

➤ **To change the observer's speed, use any of the following methods:**

- Adjust one of the Observer Speed sliders on the Observer Control Panel (Figure 18 on page 28) or on the Observer Settings page on the Display Settings dialog box. The default (center of the slider) is 1. The range is 0.1 to 10.
- Press one of the following keys to change linear speed:
  - **Keypad 7** (faster) or **1** (slower).
  - **Ctrl**+mouse wheel forward or back.
  - Movement key + mouse wheel forward or back.
- Press **Keypad +** (faster) or **-** (slower) to change orbital speed.

> ⓘ When you change the observer's speed using the keyboard or mouse, if the Observer Control Panel or the Observer Settings page is open, you can see the scale slider moving to the new setting.

3.12. Saving and Recalling Views

At any given moment, the state of the observer is called its view. You can capture views so that you can quickly return to them. You can also save them for future use. VR-Forces automatically saves observer views as part of the scenario (*scenario_name.osrx*). You can also save views independently of scenarios.

VR-Forces supports the following use cases for saving observer views:

- Associate views with a terrain. Save one or more absolute observer mode views and associate them with a terrain. The views are loaded automatically when the terrain loads. You can specify a default view that the observer jumps to immediately.
- Save a mix of absolute mode and attached mode views to a file. This use case is best when you want to create a set of views for use with multiple scenarios. You can import the file into each scenario that you want to use it with.

> ⓘ Nothing prevents you from including observer views that are attached to a simulation object in a terrain's saved views file, but they will not work unless the specific simulation object is available in the simulation.

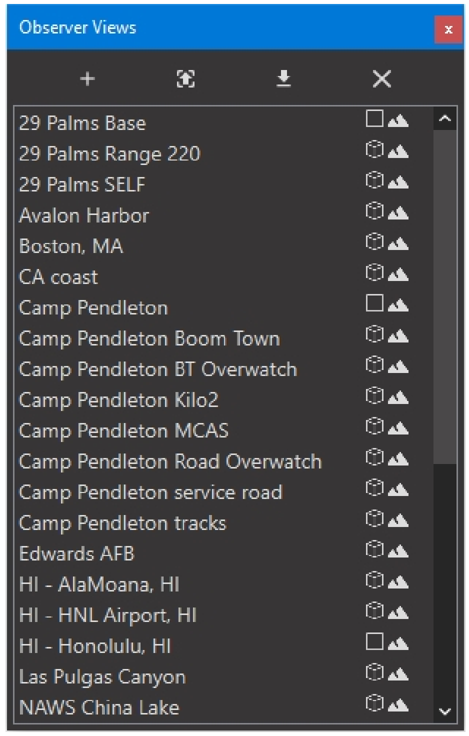
If the observer is not attached to a simulation object, its view is its position and orientation in the simulated environment. If the observer is attached to a simulation object, a view saves the:

- Attach mode.
- Positional offset.
- Marking text.

> ⓘ When you save a view in the 2D view, the X and Y values are saved. The zoom level is not saved.

Saved views are managed in the Observer Views Panel (Figure 27).

Figure 27. Observer Views Panel



The buttons in the Observer Views Panel:

- Add the current view as a new observer view.
- Save the views to a file.
- Load a saved views file and append it to the list.
- Clear the list.

The icons in the Observer Views list are:

- 3D view, such as Stealth, XR, or Out-the-Window.
- 2D view, such as Plan View.
- View is associated with the terrain.
- Default view for the terrain.
- Default scenario view.

> Saved views are keyed to the marking text of the object to which the observer is attached.

➤ To save the current view:

1. Choose **Views > Observer Views Panel**. The Observer Views Panel opens (Figure 27).
2. Click the Add button (). The current view is added to the list.

3.12.1 Recalling a View

➤ To recall a view, select it in the Observer Views Panel. The view changes immediately.

Animating Transitions Between Observer Views

Normally, when you select an observer view, the observer jumps immediately to the new view. However, VR-Forces can smoothly transition from the current observer view to a saved view.

➤ To transition between observer views, hold down the **Ctrl** key and click the view in the Observer Views Panel that you want the observer to move to.

> ⓘ If the observer view that you select uses a different observer mode (for example, you would be moving from Plan View mode to Stealth), VR-Forces does not change the observer mode. The view moves to an approximation of the desired view in the current observer mode.

3.12.2 Deleting Views

➤ **To delete a view:**

1. In the Observer Views Panel, select the view you want to delete.
2. Right-click on the view and then choose **Delete Observer View** from the context menu.

Clearing the View List

When you clear the list, VR-Forces removes all scenario-specific views and marks views that are associated with the terrain as hidden. When you load a scenario that has views associated with the terrain, VR-Forces ignores any views that are marked as hidden in the scenario. If additional views were associated with the terrain after the observer views list was cleared for the scenario, they are not marked as hidden and, therefore, are loaded. (Hidden views are recorded in the scenarios *.scn* file.)

➤ To remove all views from the list, in the Observer Views Panel, click the Clear List button (✕).

3.12.3 Loading Views Automatically When You Load a Terrain

You can associate a saved views file with a terrain so that it loads automatically when the terrain loads. You can also specify that one of the views be the default view. This is most useful when you create a new scenario. Once you save a scenario, the observer views saved with the scenario take precedence over the views associated with the terrain.

You associate views with a terrain by saving the views to a file in the same directory as the MTF file (by default, *./SharedData/##/latest/TerrainData/TerrainConfiguration*). The file must have the same name as the terrain and the extension *.osrx*. The next time you open the terrain, the views are listed in the Observer Views Panel. An icon ( ) next to each view shows that it is associated.

The views associated with the terrain are not saved as part of the scenario. Each time you load a scenario, if there are views associated with the terrain, they are loaded (unless they are marked as hidden in the scenario file). Then the views saved in the scenario are loaded.

> ⓘ The file used for associating views with a terrain is different from the file that is created when you manually save views to a file, as described in "3.12.5 Saving Views to a File" on the next page.

➤ **To associate views with a terrain:**

1. Click the Export Views button ( ). A file browser dialog box opens.
2. Change directory to the directory where the terrain's MTF file is, usually *./SharedData/##/latest/TerrainData/TerrainConfiguration*.
3. Save the views to a file that has the same name as the MTF file.

Specifying a Default Observer View for a Terrain

If you associate views with a terrain, you can specify that one of the views be the default view to use. A star is added to the association icon for default views ( ).

You can specify a default 3D view and a default 2D view. When you load a terrain, if there are two default views and the current observer mode is a 3D mode, it uses the 3D default view. If the current observer mode is a 2D mode, it uses the 2D default view.

➤ **To specify a default observer view:**

1. Right-click the observer view that you want to be the default.
2. On the shortcut menu, choose **Set As Default Terrain View**.

Unsetting a Default View for a Terrain

➤ **To unset a default observer view:**

1. Right-click the default observer view.
2. On the shortcut menu, choose **Unset Default Terrain View**.

3.12.4 Specifying the Scenario Startup View

If a scenario has observer views, you can specify that one of them be the view selected when the scenario loads. (The observer view is not selected when you rewind a scenario.) If a scenario has a default observer view and the terrain has a default observer view, the scenario observer view is used.

➤ **To specify a view as the startup view:**

1. Right-click the view.
2. On the shortcut menu, choose **Set Default Scenario View**. A star icon next to the view shows that it is the default view.

Unsetting a Default Scenario View

➤ **To unset a default observer view:**

1. Right-click the default observer view.
2. On the shortcut menu, choose **Unset Default Scenario View**.

3.12.5 Saving Views to a File

You can save views to a file independently of the scenario and load them at a later time. The default location for saved views is *./appData/settings/vrfGui*. When you create a 2D view for a terrain that includes 2D View Layers, that view includes the currently specified layer.

Saving views to a file is not the same thing as associating views with a terrain. When you associate views with a terrain, they load automatically and you can specify a default view to use immediately. When you save views to a file, you need to load them manually, or from the command line. You cannot specify a default view.

Associating views with a terrain is most beneficial for saving a set of Absolute mode observer views that you always want to be available to the terrain, regardless of the simulation that you are connected to. Saving views to a file manually is most beneficial for saving views when the observer is attached to simulation objects in a simulation or for simulation-specific Absolute mode views.

➤ **To save all views to a file:**

1. In the Observer Views Panel, click the Export Views button (). The Save Observer Views dialog box opens.
2. Select the file to which you want to save the views, or type the name of a new file.
3. Click OK.

Saving an Individual View to a File

You can save a single view to a file.

➤ **To save an individual view to a file:**

1. Right-click the view that you want to save.
2. On the menu, choose **Save Observer View**. The Save Observer View File dialog box opens.
3. Type a name for the file.
4. Click Save.

3.12.6 Loading Views

You can load saved views and append them to the list in the Observer Views Panel.

If a scenario has observer views saved as part of the scenario, they are loaded automatically when you load the scenario. If you have saved views independently of the scenario, you can load them and append them to the list in the Observer Views Panel.

> To load a view, you can also drag and drop the *.osrx* file onto the Observer Views Panel and then select it.

➤ **To load views and append them to the list of views:**

1. In the Observer Views Panel (Figure 27 on page 41), click the Import and Append Views button ( ). The Open Observer Views dialog box opens.
2. Select the saved views file that you want to load.
3. Click OK.

3.13. Using the Go To Location Panel

The Go To Location panel allows you to move the current observer to the specified address, latitude and longitude, or MGRS coordinates.

➤ **To go to a location:**

1. Open the Go To Location panel (**View > Go To Location**).
2. Select the method you want to use and then enter the appropriate information:
   - To go to an address, select Go to Address and then enter the complete address. This requires an internet connection. If VR-Forces cannot find some address to match, it displays an alert icon. Hover the mouse over it for more information.

     You can also enter the code for an airport and use that to go to the airport's location.
   - To specify the location's coordinates, select a coordinate system from the Goto Location drop-down list and then enter the coordinates in the text boxes.
3. Click Go. The Go button becomes active when you have entered the required information.

   If you entered an address but the current observer did not jump to the address you specified, there was an error. An icon displays next to the address field. Hover the mouse over the icon to read the error message.

3.14. Controlling the Observer from Other Applications

The VR-Forces GUI can respond to view control messages sent by applications such as the MAK Data Logger. It also responds to view control messages sent from entity plans and global plans. You can write VR-Link-based applications to send view control messages to VR-Forces using the classes in the VR-Vantage Control Toolkit.

You can use view control messages to:

- Specify the attach mode and simulation object.
- Set the observer's position and orientation.

Acceptance of view control messages is a global setting.

> The view control PDUs are experimental, and are not an official part of DIS. They are of PDU kind 202.

3.14.1 Enabling the Processing of View Control Messages

➤ To enable or disable the processing of view control messages, choose **Settings > View Controls**.

4. Attaching the Observer to Objects

This chapter describes attachment modes and how to attach the observer to simulation objects and props.

4.1. Attaching the Observer to a Simulation Object or Prop

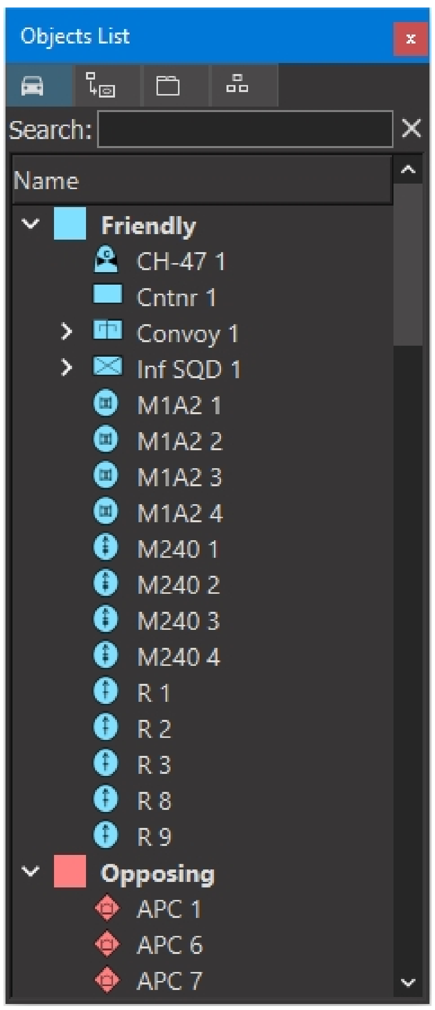
You can attach the observer to a simulation object and follow it as it moves through the simulation. You can also attach the observer to props and to other observers.

> ⓘ This procedure applies to Follow, Tether, Track, Mimic, and Space Follow modes. To attach in Tether Track or Mimic Track mode, see "4.1.3 Attaching the Observer in Mimic Track or Tether Track Mode" on page 50. To attach in Tether Location Track or Mimic Location Track mode, see "4.1.4 Attaching the Observer in Mimic Location Track or Tether Location Track Mode" on page 50.

➤ **To attach the observer to a simulation object or prop, do one of the following:**

- Right-click an object in the Objects List Panel (Figure 28) or on the terrain and select **Observer Attach > Attach** *mode*, where *mode* is one of the supported attach modes. (For details about attach modes, see "4.2. Attach Modes in the 3D View" on page 52 and "4.3. Attach Modes in the 2D View" on page 58.)

Figure 28. Objects List Panel



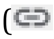
- Select a simulation object or prop. (For details about selecting simulation objects and props, see and "Selecting Props" in the *Adding Content to MAK ONE Applications Reference Manual*.) On the Attachments Panel (Figure 29), or on the Attach Object Toolbar (Figure 30), click the Attach button
() to attach with the current attachment mode.

Figure 29. Attachments Panel

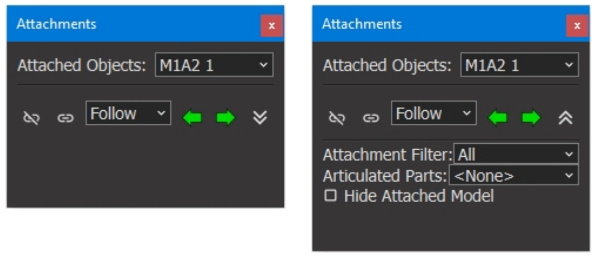


Figure 30. Attach Object Toolbar

- On the Attachments Panel or Attach Object Toolbar, click the next or previous arrows to attach to the next (or previous) object in the object list.
- **Shift**+click the object you want to attach to.
- Press greater than (**>**) to attach to the next simulation object or prop in the Objects List without regard to the attachment filter. Press less than (**<**) to attach to the previous object.
- Press period (`.`) to attach to the next simulation object or prop allowed by the attachment filter. Press comma (`,`) to attach to the previous object.

> ⓘ
> - When you select the next or previous object, VR-Forces chooses next and previous based on the order in which the objects were discovered. This might represent the order in which they are listed in the Objects List Panel.
> - When you move the attachment from one object to the next, VR-Forces preserves whatever changes you have made to the observer's view relative to the attached object. For example, if you moved the observer so that it is not looking at the attached object, when you attach to the next simulation object, the observer will not be looking at this object. It will be in the same relative position to the object that you previously established. To quickly return to the default offset for the attachment mode, press **Spacebar**.

4.1.1 Attaching the Observer to Another Observer

You can attach observers to other observers if you have more than one window open.

➤ **To attach an observer to another observer:**

1. Filter the Objects List to show All objects or to show observers.
2. Select the window whose observer you want to attach to another observer.
3. In the Objects List, select the observer you want to attach to.
4. Right-click and select **Observer Attach > Attach** *mode*, where *mode* is one of the supported attach modes.

4.1.2 Attaching to an Articulated Part

You can attach the observer to an articulated part on an entity, such as a turret. When you attach to an articulated part, the observer moves with the articulated part instead of the main body of the entity.

➤ **To attach to an articulated part:**

1. Attach the observer to an entity, as described in "4.1. Attaching the Observer to a Simulation Object or Prop" on page 48.
2. On the Attachments Panel (Figure 29 on the previous page), click the down arrow. The Attachments Panel expands.
3. In the Articulated Parts list, select the part to which you want to attach the observer.

4.1.3 Attaching the Observer in Mimic Track or Tether Track Mode

To attach the observer in Tether Track and Mimic Track modes, you must specify a primary simulation object and a secondary simulation object (the tracked simulation object).

➤ **To attach the observer in Mimic Track mode or Tether Track mode:**

1. Right-click the primary simulation object in the Objects List Panel or in the window. A shortcut menu displays.
2. Choose **Observer Attach > Attach Mimic Track** (or **Attach Tether Track**). The cursor changes to show an arrow and a Plus sign.
3. Click the secondary simulation object in the Objects List or in the window.

4.1.4 Attaching the Observer in Mimic Location Track or Tether Location Track Mode

To attach the observer in Tether Location Track and Mimic Location Track modes, you must specify a primary simulation object and a location.

➤ **To attach the observer in Mimic Location Track mode or Tether Location Track mode:**

1. Right-click the primary simulation object in the Objects List Panel or in the window. A shortcut menu displays.
2. Choose **Observer Attach > Attach Mimic Location Track** (or **Attach Tether Location Track**). The cursor changes to show an arrow and a Plus sign.
3. Click a location in the display window.

4.1.5 Filtering the Object Attachment List

Although you can attach the observer to simulation objects and props, it is likely that at any given time you will only want to attach to one type of object (usually simulation objects). To reduce the number of objects that you have to iterate through when using Attachments Panel arrows to pick the next or previous object, you can filter the attachment list.

> ⓘ The filter for buoys and beacons applies to S-57 feature data, not buoys that are simulation objects, such as sonobuoys.

➤ **To filter the attachment list:**

1. On the Attachments Panel (Figure 29 on page 49), click the down arrow. The Attachments Panel expands.
2. In the Attachment Filter list, select the type of scene element that you want to attach to.

4.1.6 Detaching from a Simulation Object

➤ To detach the observer from the simulation object to which it is attached, click the Detach button ( ) on the Attachments Panel (Figure 29 on page 49), or press **Z**.

4.1.7 Hiding the Attached Model (3D View Only)

You can hide the model for the simulation object to which the observer is attached.

➤ **To hide the attached model:**

1. On the Attachments Panel (Figure 29 on page 49), click the down arrow. The Attachments Panel expands.
2. Select the Hide Attached Model check box.

4.1.8 Attaching to Props

Since props do not move, attaching the observer to a prop does not result in any observer movement. The principal benefit of attaching to a prop is to let you quickly refocus the observer on a particular location in the scene. If you attach in Track mode, using the keyboard movement keys allows you to orbit around the prop.

4.1.9 Improving Performance when Attaching to Ground Objects

When the observer is attached to air entities, Z-fighting can affect visual quality. To prevent this problem, VR-Forces needs to calculate the entity's height above the terrain. However, the calculation can affect performance. Unfortunately, when this calculation is enabled (the default), it must be applied to all entity types. If you know that you will want to attach the observer to ground simulation objects, but not air simulation objects (or if you do not care about Z-fighting), you can disable the height above terrain calculation, which may improve performance when the observer is attached to simulation objects. To disable the height above terrain calculation, start VR-Forces with the `-S | --suppressHatIntersectOnAttach` command-line option.

4.2. Attach Modes in the 3D View

Attach modes are combinations of position and orientation models and constraints that produce a useful behavior for the observer. Except for Absolute mode, attach modes describe how movement of the simulation object to which the observer is attached affects the position and orientation of the observer.

VR-Forces supports these attach modes:

- Absolute: The observer is not attached to a simulation object; it moves in space independently of all simulation objects.
- Follow: The observer position and heading changes with the simulation object's position and heading.
- Mimic: The observer position and orientation changes with the simulation object's position and orientation.
- Mimic Track: The observer's position changes with the simulation object's position while its orientation is focused on a second entity.
- Mimic Location Track: The observer's position changes with the simulation object's position while its orientation is focused on a location.
- Space Follow: The observer is a fixed distance from the simulation object and the simulation object model is scaled to be observable from a great distance.
- Tether: The observer's position changes with the simulation object's position.
- Tether Track: The observer's position changes with the simulation object's position while its heading is focused on a second simulation object.
- Tether Location Track: The observer's position changes with the simulation object's position while its heading is focused on a location.
- Track: The observer's heading changes to track the simulation object's position and heading.

The attach modes are described in detail in the following sections. For details about how to attach the observer to a simulation object, see "4.1. Attaching the Observer to a Simulation Object or Prop" on page 48.

4.2.1 Absolute Mode

In Absolute, or free-fly mode, the observer is not attached to a simulation object. Movement of simulation objects does not affect the observer in any way.

4.2.2 Follow Mode

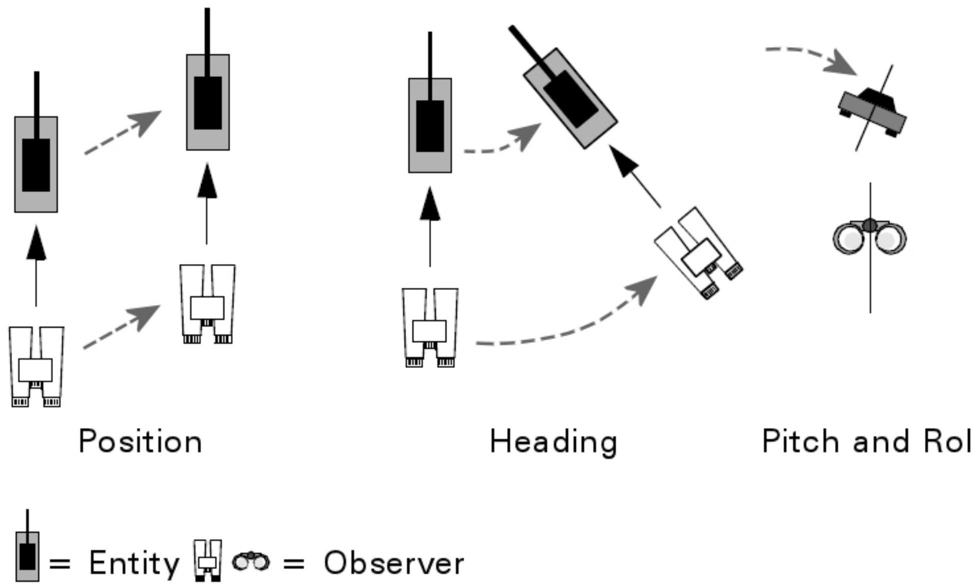
In Follow mode, the observer maintains its relationship to the simulation object:

- When the simulation object's position changes, the observer's position changes to maintain its offset.
- When the simulation object's heading changes, the observer's heading and position change to maintain the offset.

- When the simulation object's pitch or roll change, the observer pitch and roll do not change.

Figure 31 illustrates the characteristics of Follow mode.

Figure 31. Follow mode



4.2.3 Mimic Mode

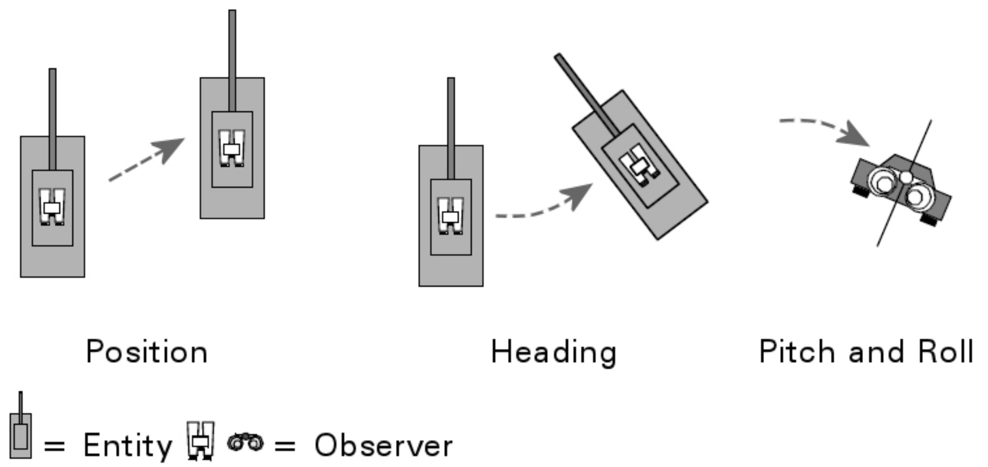
In Mimic mode, the observer behaves as though it is rigidly connected to the entity. Use Mimic mode to create the effect of riding in a vehicle cockpit, or of following a vehicle from an external location while connected to it by a solid, invisible rod. The observer maintains its relationship to the simulation object:

- When the simulation object's position changes, the observer's position changes to maintain its offset.
- When the simulation object's heading changes, the observer's heading and position change to maintain the offset.
- When the simulation object's pitch or roll change, the observer's pitch and roll change and the observer's position changes to maintain its offset.

> When cockpit displays are enabled, you cannot change the position or orientation of the observer relative to the entity.

Figure 32 illustrates the characteristics of Mimic mode.

Figure 32. Mimic mode



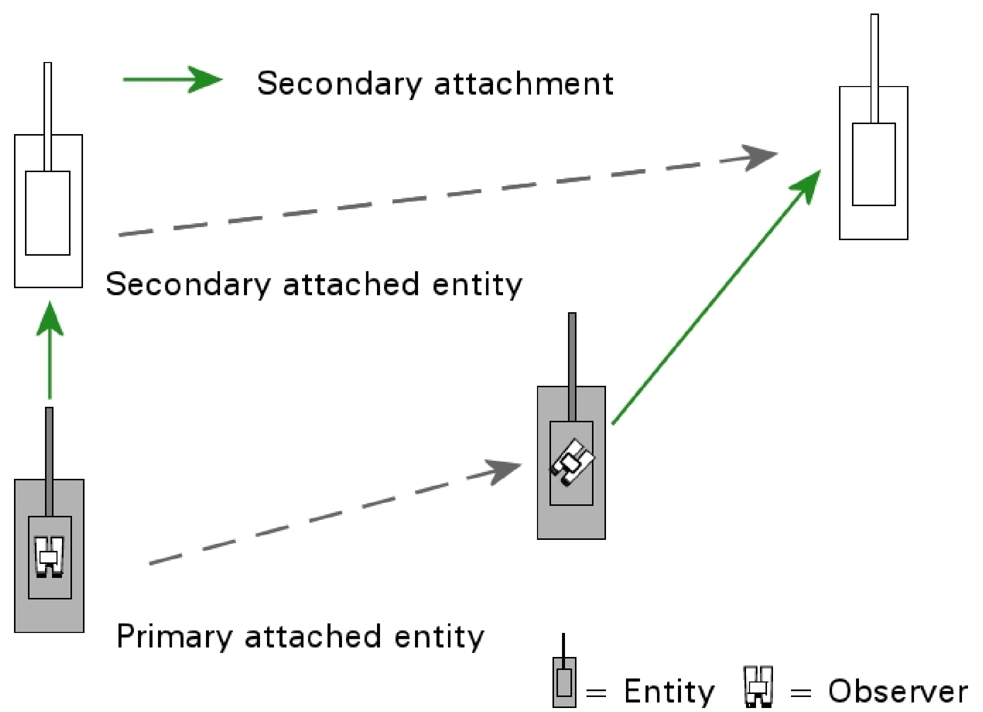
4.2.4 Mimic Track Mode

Mimic Track mode combines Mimic mode and Track mode. The observer's position changes with that of the entity to which it is attached, as in Mimic mode, while its orientation changes to remain focused on a secondary, tracked entity.

Orientation controls are disabled.

Figure 33 illustrates the characteristics of Mimic Track mode.

Figure 33. Mimic Track mode



4.2.5 Mimic Location Track Mode

Mimic Location Track mode works like Mimic Track mode except it tracks a location on the ground rather than an entity.

4.2.6 Space Follow Mode

Space Follow mode attaches the observer above an entity, looking down at it. Although it can be used with any entity, its primary purpose is for attaching to space objects such as satellites. You can also usefully use it with fixed-wing and rotary-wing entities.

The observer is attached at a fixed distance, determined by the near clipping plane for the object. For a satellite, this distance is approximately 500,000 meters. Since it is not possible to see regular models at that distance, the attached object is scaled to be visible. (You cannot change the scaling of the attached object.) Other objects are not scaled (except to the extent that model scaling might be enabled).

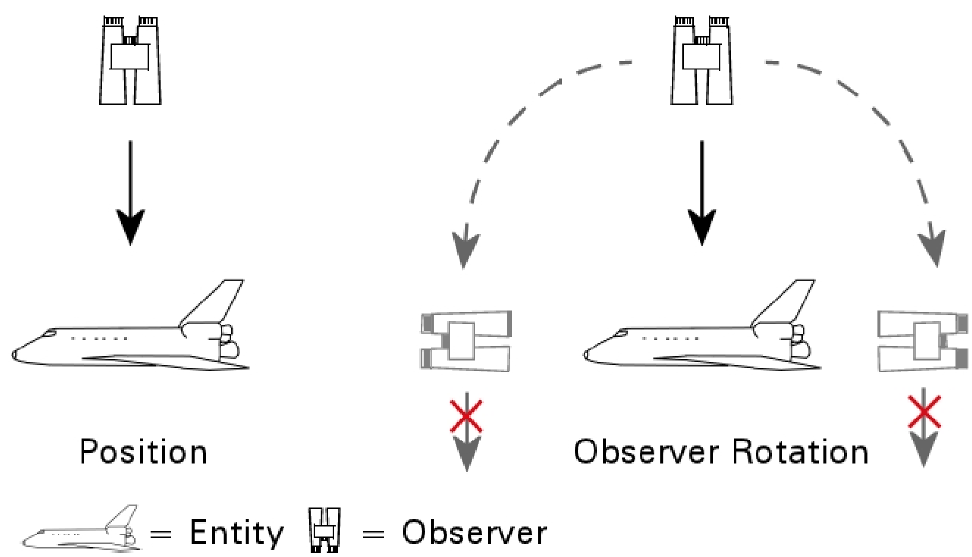
The observer maintains its relationship to the simulation object:

- When the simulation object's position changes, the observer's position changes to maintain its offset.
- When the simulation object's heading changes, the observer's heading changes.
- When the simulation object's pitch or roll changes, the observer's pitch or roll does not change.

You cannot move the observer towards or away from the simulation object. You can rotate the observer around the entity, but you cannot go below the horizontal plane of the entity.

Figure 34 illustrates the characteristics of Space Follow mode.

Figure 34. Space Follow mode



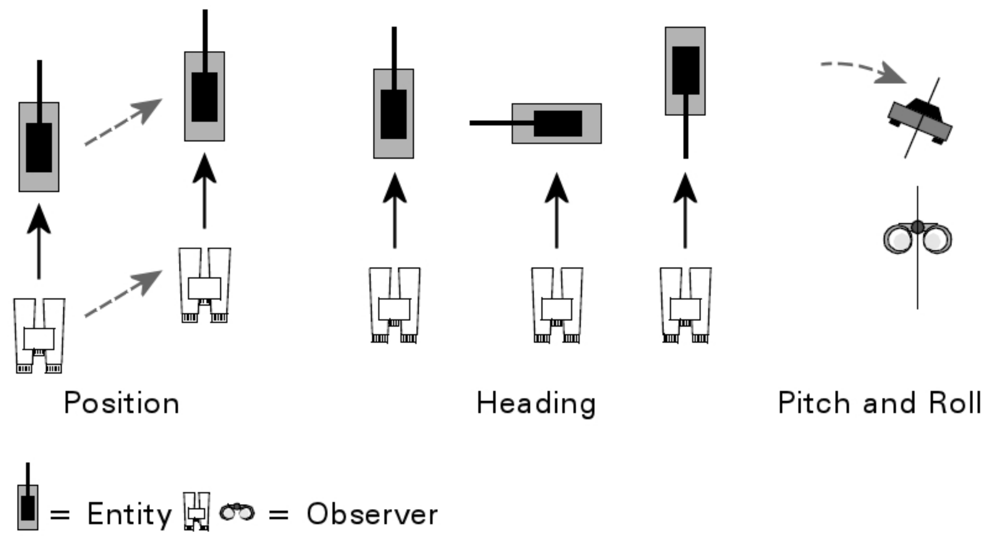
4.2.7 Tether Mode

In Tether mode, the observer's maintains a constant offset from the simulation object, but it is not affected by the simulation object's heading, pitch, or roll:

- When the simulation object's position changes, the observer's position changes to maintain its offset.
- When the simulation object's heading changes, the observer's heading does not change.
- When the simulation object's pitch or roll change, the observer's pitch and roll do not change.

Figure 35 illustrates the characteristics of Tether mode.

Figure 35. Tether mode



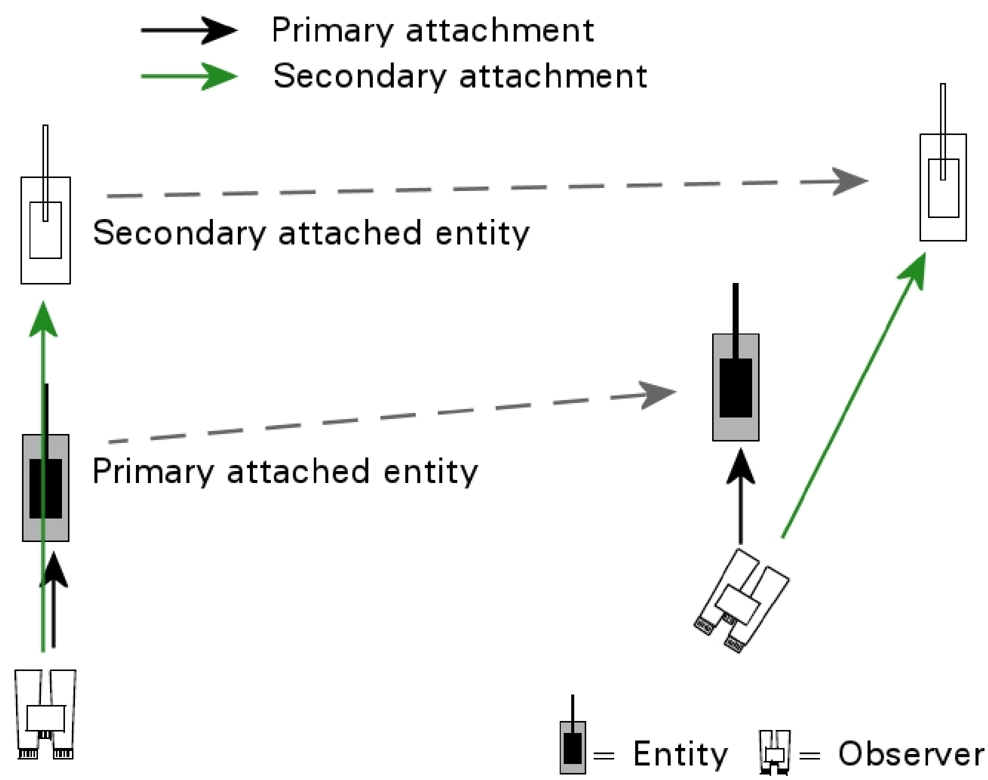
4.2.8 Tether Track Mode

Tether Track mode combines Tether mode and Track mode. The observer's position changes with that of the entity to which it is attached, as in Tether mode, while its orientation changes to remain focused on a secondary, tracked entity.

Orientation controls are disabled.

Figure 36 illustrates the characteristics of Tether Track mode.

Figure 36. Tether Track mode



4.2.9 Tether Location Track Mode

Tether Location Track mode works like Tether Track mode, except that it tracks a location on the ground instead of an entity.

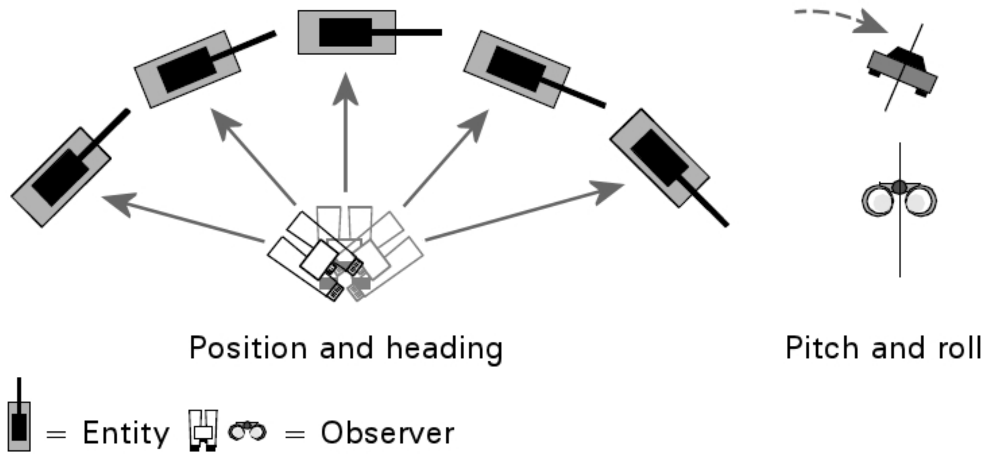
4.2.10 Track Mode

In Track mode, the observer's heading changes to track the simulation object's movement, keeping it centered in the field of view. The observer's position does not change. The observer maintains its relationship to the simulation object:

- When the simulation object's position changes, the observer's heading changes to keep the entity centered in the observer's view; the observer's position does not change.
- When the simulation object's heading changes, the observer's heading does not change.
- When the simulation object's pitch or roll change, the observer's pitch and roll do not change.

Figure 37 illustrates the characteristics of Track mode.

Figure 37. Track mode



4.3. Attach Modes in the 2D View

The 2D view supports Follow mode and Tether mode. In Follow mode, the heading of the observer changes with the entity (if Orient North is disabled); in Tether mode, it does not. You can use the standard movement keys (**W**, **A**, **S**, **D**) to offset the observer with respect to the simulation object's position. You can use the orbit keys (left arrow, right arrow) to offset the observer's orientation with respect to the entity's orientation (in Follow mode) or the terrain.

If the observer is attached to an entity in the 3D view and you switch to the 2D view, the attach mode maps to either Follow or Tether modes, as shown in Table 2. If you then switch back to the 3D view, the original attach mode is restored.

Table 2.
3D to 2D attachment mode mapping

3D Attach Mode	2D Attach Mode
Follow	Follow
Mimic	Follow
Mimic Track	Follow
Mimic Location Track	Follow
Space Follow	Follow
Tether	Tether
Tether Track	Tether
Tether Location Track	Tether
Track	Tether

4.4. Attaching the Observer at Startup

To attach the observer to an entity when you load a scenario, save a view and specify it as a favorite, as described in "3.12.4 Specifying the Scenario Startup View" on page 43.

5. Inset Views, Sensor FOVs, HUDs, and Depth of Field

This chapter describes several kinds of special secondary windows plus head up displays.

5.1. Inset Views

You can display inset views of individual simulation objects. Figure 38 shows a helicopter hovering over the Ala Moana area in the *MAK Earth (online).mtf* terrain with an inset view of cars driving through the town.

Figure 38. Inset view

> ⚠ By default, when you create an inset view, the observer in the inset view is attached to the simulation object in Mimic mode. This has the side effect of causing the 3D model in the main window to disappear. (The reverse occurs if you attach the observer in the main window to the simulation object in Mimic mode.) To make the model reappear, select the inset view and change the attach mode or detach the observer.

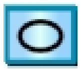
You can change the observer position and orientation in an inset view using keyboard controls. You can also edit window and channel properties for the window in the Display Engine Configuration Editor. (For information about the Display Engine Configuration Editor, see "Windows, Channels, and Display Engines".)

When you create an inset view, the title bar contains the simulation object's name. However, the window is not actually tied to the simulation object and you can change the view in the inset view and view other simulation objects. The title bar will continue to display the name of the simulation object for which the window was created.

➤ **To open an inset view:**

1. Select the object for which you want to create an inset view.
2. Choose **Objects > Create Window > Create Inset View**.

> ⓘ You can also right-click on the object and then choose **Create Window > Create Inset View**.

5.2.  Displaying Cockpit Displays

VR-Forces can display cockpit displays created with GL Studio. It includes cockpits for fixed-wing, rotary-wing, and ground vehicle entities. As with other entity effects, cockpits have schemas and model definitions that you map to entity types. For details about cockpit display models, see "Adding New Cockpit Display Models" in the *Adding Content to MAK ONE Applications Reference Manual*.

VR-Forces supports 2D cockpits (Figure 39) and 3D cockpits (Figure 40). A 2D cockpit is fixed to the center of the screen and you cannot zoom in or out on the instrument panel. A 3D cockpit is aligned with the front of the vehicle. If you move the eyepoint, the instrument panel moves in or out of view as you would expect. You can zoom in and out on the instruments.

Figure 39. 2D cockpit

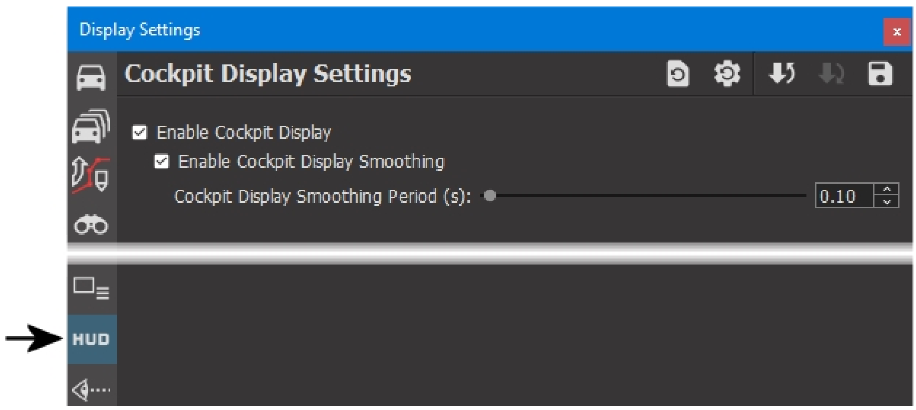
Figure 40. 3D cockpit

- Cockpits display only when the observer is attached to an entity in Mimic mode.
- VR-Forces includes one 3D cockpit, for the F-16 fighter jet.
- Cockpits are not supported on Linux.

➤ To display cockpits:

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Cockpit Display Settings page (Figure 41).

Figure 41. Cockpit display settings



3. Select or clear the Enable Cockpit Display check box.
4. Optionally, select the Enable Cockpit Display Smoothing check box. This smooths the display in the dynamic widgets, such as orientation or velocity, so they show a smoothed value rather than instantaneous changes.
5. Attach the observer to an entity in Mimic mode.

You can also enable and disable cockpit displays by choosing **Settings > Cockpit Displays**.

5.3. Displaying Instrument Panels

Instrument panels are inset windows that display a vehicle instrument such as an altimeter or artificial horizon. Unlike a cockpit display, which is a fixed display that operates in Mimic mode, an instrument panel is an independent window (like an inset view) that you can place anywhere on the screen (Figure 42). It does not affect the observer mode. You can organize multiple instrument panels to create your own virtual cockpit.

Figure 42. Instrument panels

When you create an instrument panel, the title bar of the window lists the entity for which you created it.

> ⓘ
> - Instrument panels are GL Studio controls.
> - Instrument panels are not supported on Linux.
> - If the source of the instrument panel is removed from the exercise, for example when a Logger recording rewinds, the instrument panels are removed from the inset windows. To see them again you must open new instrument panels. Because the relationship between an instrument panel window and an entity is not persistent across multiple runs of an exercise, you cannot save an instrument panel layout for an entity. (You could save the layout of the windows to a display configuration, but they would not display instrument panels when you loaded the configuration.)
> - If you want to put multiple instrument panels in one window, like the six-pack panel provided with VR-Forces, you must use GL Studio.

➤ **To open an instrument panel:**

1. Select the entity for which you want to display an instrument panel.
2. Choose **Object > Create Window > Create Instrument Panel >** *panel*, where *panel* is one of the instrument panels listed.

> ⓘ You can also right-click on the object and then choose **Create Window > Create Instrument Panel >** *panel*.

5.3.1 Configuring Entities to Use Instrument Panels

VR-Forces includes a set of instrument panels for fixed-wing aircraft, although many of them may be appropriate for rotary-wing aircraft, and even for ground vehicles. (For example, you might want to show a compass for a ground vehicle to display its heading, or an altimeter to display the height above sea level.) The availability of instrument panels to an entity is determined by the **instrumentPanelCategory** parameter in its model definition.

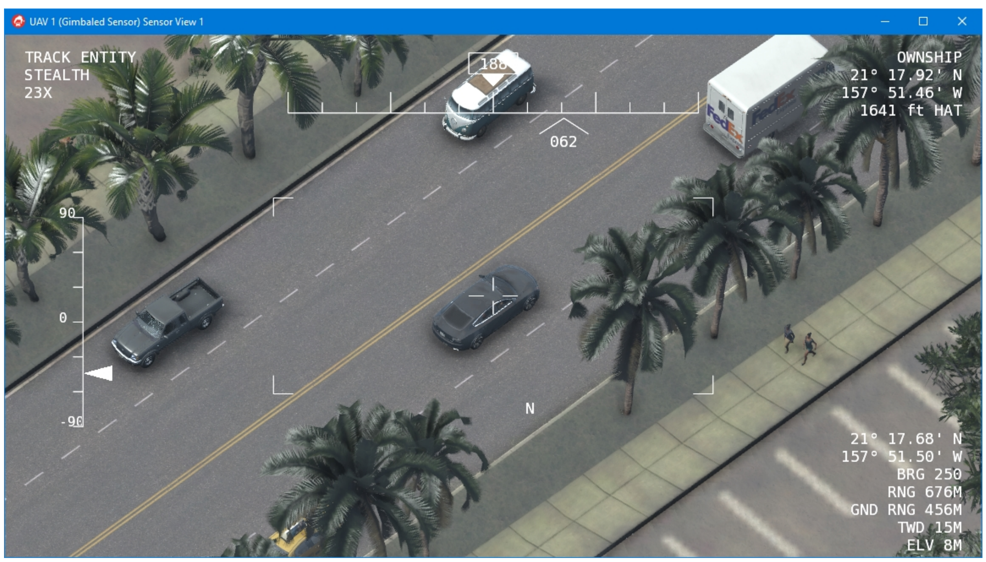
The instrument panels provided with VR-Forces have the **instrumentPanelCategory** set to FixedWing. All fixed-wing entities have this parameter set in their model definition. None of the other entities do. If you want other entities to display instrument panels provided with VR-Forces, you can add this parameter to their model definitions. (You could also copy an instrument panel model definition and change the category to some other value if you want to. Regardless, to use an instrument panel, an entity's model definition must include the **instrumentPanelCategory** parameter and have it set to a valid value.)

If you create new instrument panels, you must add instrument panel model definitions for them and specify a value for the **instrumentPanelCategory** parameter. Then you can add the parameter to the appropriate entity model definitions.

5.4. Displaying Sensor Views

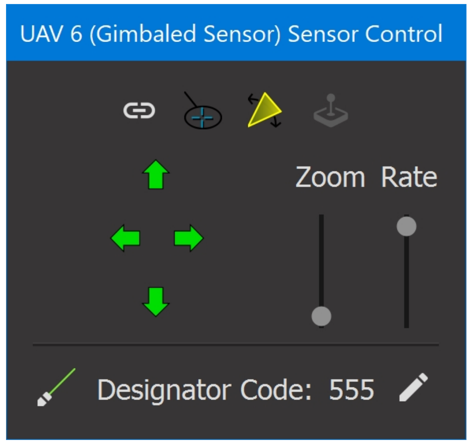
VR-Forces can display the view from gimbaled visual sensors, such as a camera on a UAV (3D only). The view is displayed in an inset window that has information about the observer mode and area being viewed (Figure 43). The window has its own observer and you can change the observer mode in the view.

Figure 43. Sensor View



Each sensor view has a control panel (Figure 44) that you can use to move the sensor, change its aim, and zoom in and out. You can also lase whatever the sensor is looking at.

Figure 44. Sensor Control Panel



The UAVSensorDemo example scenario demonstrates use of an entity with a gimbaled sensor. The scenario also has a Lua script that shows how to successively aim the sensor at many entities.

➤ **To display a sensor view:**

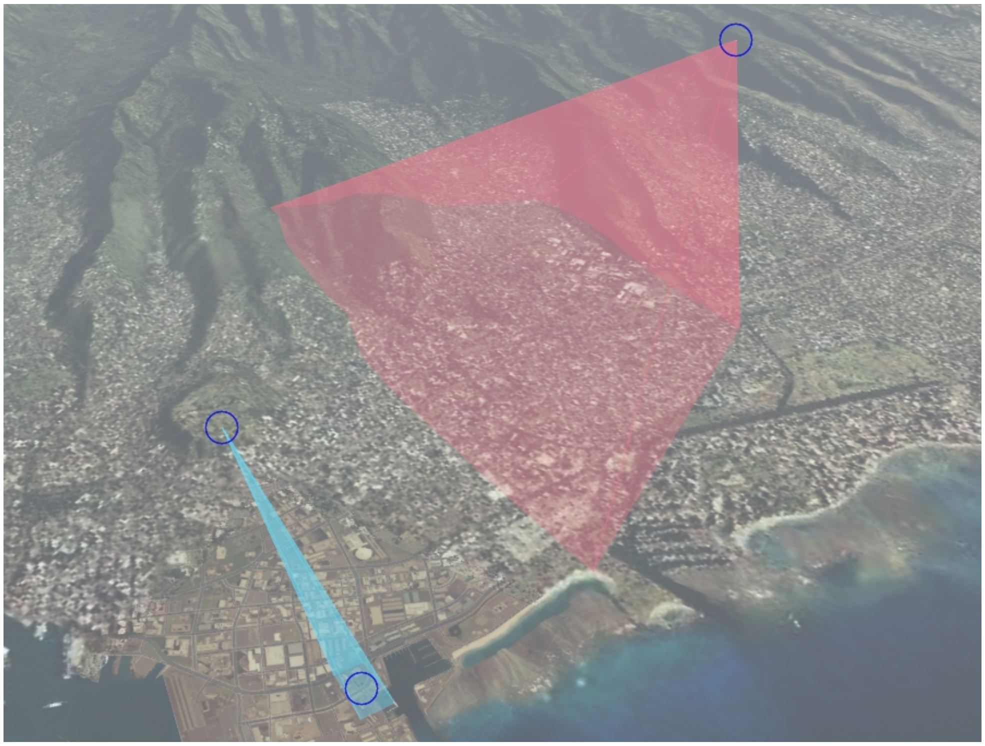
1. Select an entity that has a gimbaled sensor.
2. Choose **Object > Create Window > Create Sensor View >** *sensor*, where *sensor* is one of the sensors on the entity.

> ⓘ You can also right-click on the object and then choose **Create Window > Create Sensor View >** *sensor*.

5.4.1 Displaying a Sensor Field of View Cone

You can display translucent cones that show the area on the terrain that a gimbaled sensor is observing. Each cone is a different color. Figure 45 shows two sensor field of view cones. One is focused on an entity and is zoomed in for a tight focus. The other is focused on a point on the terrain.

Figure 45. Sensor field of view cones



➤ **To display sensor field of view cones:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2 on page 6).
3. In the list of settings, select the Sensor Fields of View check box.

> ⓘ You can also enable and disable sensor field of view cones by choosing **Observer > Sensor Fields of View** or by clicking the Sensor Fields of View button ( ) on the Observer Settings Toolbar.

5.4.2 Controlling the Sensor View

When a sensor view opens, a control panel opens with it (Figure 44 on the previous page). This control panel works only with its associated sensor view. If you open multiple sensor views, there will be a control panel for each one. Use the Sensor Control Panel to:

- Aim the sensor at a simulation object or a point on the terrain. (You can also aim a sensor with the Sensor Aim set data request. For details, see "Sensor Aim".)
- Set the sensor to scan mode. (You can also set a sensor to scan with the Sensor Aim set data request.)
- Take control of the sensor with a joystick. The joystick must be configured for use with the sensor view. For details about configuring joysticks, see "Configuring Joysticks and Keyboard Control".

- Zoom the sensor. (You can also zoom a sensor with the Sensor Zoom set data request. For details, see "Sensor Zoom".)
- Move the sensor field of view. You can change the sensitivity of the movement buttons.
- Lase the center point of the sensor view.
- Set the laser's designator code.

> ⓘ If you zoom the sensor view to the maximum magnification and the terrain turns white, you can fix the problem by setting the clipping plane to Clamp Near Clip When Magnified. For details, see "Setting the Clipping Planes".

➤ **To aim the sensor at a simulation object:**

1. Click the Track an Entity button (). The Entity to Track dialog box opens.
2. Select the simulation object you want to aim at.
3. Click OK.

➤ **To aim the sensor view at a location:**

1. Click the Track Location button (). The Location to Track dialog box opens.
2. Click a location on the terrain or enter the coordinates in the dialog box.
3. Click OK.

➤ To set a sensor to scan mode, click the Scan button ().

➤ To control the sensor field of view with a joystick, click the Joystick button ().

➤ To zoom the sensor view, adjust the Zoom slider.

➤ To move the sensor view, click any of the arrow buttons.

➤ To change the rate at which the arrow buttons move the sensor view, adjust the Rate slider.

Controlling Lasing from the Sensor View

If the entity is equipped with laser guidance, you can enable lasing. If you enable lasing, the entity to which the sensor view is attached lases the center point of the sensor view (Figure 46).

Figure 46. Lasing a point in a sensor view

➤ To lase the center point of the sensor view, in the Sensor View control panel click the Lase Object button ( ) on the control panel.

VR-Forces calculates a unique laser code for each sensor view so that there are no duplicate codes. You can change the laser designator code.

➤ **To specify the laser designator code when lasing from a sensor view:**

1. In the Sensor View control panel, click the Laser Code button ( ). The Laser Code dialog box opens.
2. Type a 3- or 4-digit code between 111 and 1788, using only digits 1 through 8.
3. Click OK.

Configuring a Gimbaled Sensor's Azimuth

The characteristics of a gimbaled sensor, such as where it is located on an entity and the range through which the sensor can scan (the azimuth), are configured in the Gimbaled Visual Sensor system. You can edit many properties in the Simulation Object Editor. In particular, you may want to edit the azimuth. If you want the sensor to swivel 360 degrees, set the Minimum Azimuth Angle and Maximum Azimuth Angle to the same value.

➤ **To edit the properties of a gimbaled sensor:**

1. Open the Simulation Object Editor. (For details about using the Simulation Object Editor, see "The Simulation Object Editor and SMSs".)
2. Select the entity that has a gimbaled sensor.
3. Select the Systems tab.
4. In the Sensors window, select the Gimbaled Visual Sensor.
5. Click the Edit Properties button ( ).
6. Edit properties as desired.

7. Click OK.
8. Save the SMS.

5.5. Using the Depth of Field Effect

Depth of field controls the area in the scene that is in focus. Depth of field is calculated based on a focal depth and a focal range. The focal depth is the distance from the observer that is the center (focal point) of the area in focus. The focal range is the distance from the focal point that is in focus.

In Figure 47, the focal depth is about 10 meters, fairly close to the observer, and the focal range is also small, so that the scene is out of focus just past the car (note that the trees are out of focus).

In Figure 48, the focal depth is the same, but the range is much greater, so the scene is in focus to the back of the parking lot but not the building.

In Figure 49, the focal depth is centered at the trees near the sidewalk. The focal range is, again, fairly narrow, so that the person and car in the foreground are out of focus.

VR-Forces lets you set the focal depth automatically or manually. In either case, you can adjust the focal range.

Figure 47. Depth of field (close)

Figure 48. Depth of field (far)

Figure 49. Depth of field, middle distance

➤ **To enable depth of field:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Observer Settings page (Figure 2).
3. Select the observer mode for which you want to enable depth of field.
4. Select or clear the Depth of Field check box.

> ⓘ You can also enable or disable depth of field by choosing **Observer > Depth of Field**.

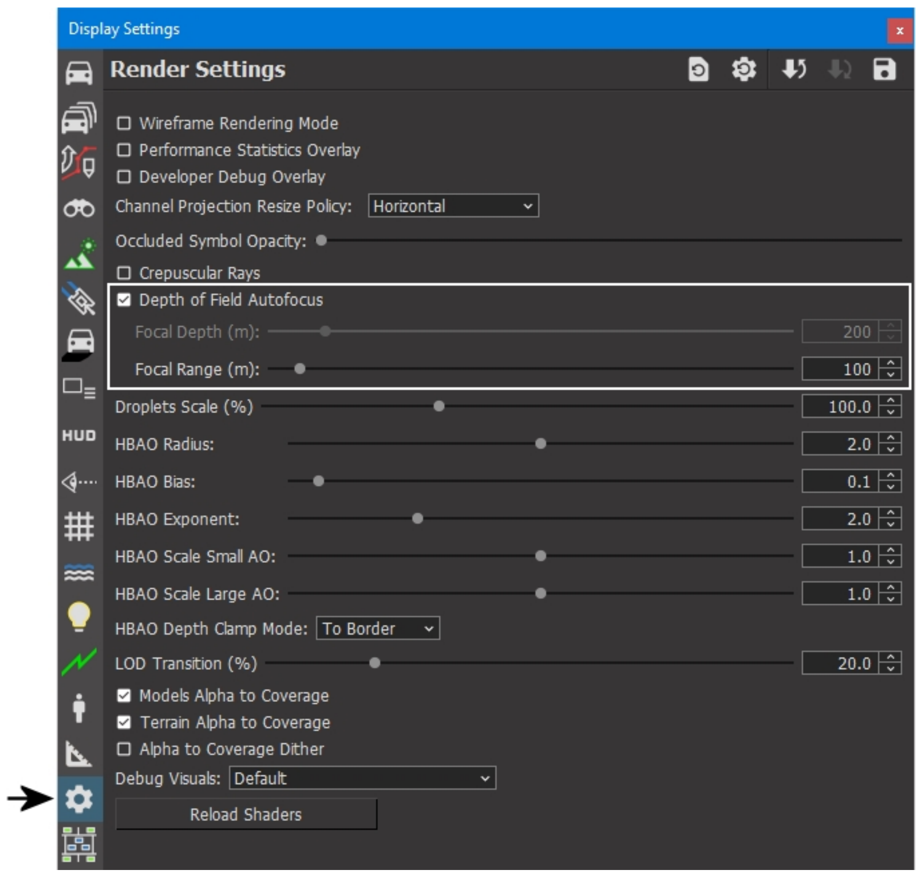
5.5.1 Configuring Depth of Field

You can enable and disable automatic depth of field and you can adjust the focal depth and focal range.

➤ **To configure depth of field:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Render Settings page (Figure 50).

Figure 50. Depth of Field settings



3. To use autofocus for focal depth, select the Depth of Field Autofocus check box.
4. To set the focal depth manually, clear the Depth of Field Autofocus check box and adjust the Focal Depth slider or specify a value in the box.
5. To adjust the focal range, adjust the Focal Range slider or specify a value in the box.