M-500-013

iDEA-DT User Manual

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1 Introduction

Welcome!

This document is intended to provide a full reference for the operation of the **iDEA-DT** (**i**nteractive **D**esign, **E**ngineering and **A**nalysis – **D**igital **T**win) application developed by GRI Simulations Inc.

If you have questions about a topic that is not covered in this document, please visit our ***web support*** for assistance.

1.1 System Requirements

To run the iDEA-DT, you will need:

System Element	Minimum Requirement
Operating System	Windows 10
Processor	i7
RAM	8 GB
Graphics Card	GeForce RTX 2060

1.2 Quick Start Guide

Software installation:

1. Run the provided installer to install the iDEA-DT software.
    - This will install all software and drivers required to run the iDEA-DT.

To quickly start and edit an existing VROV scenario:

1. Double-click the  (**iDEA-DT** icon) on the Desktop.
2. Select **File > Open Scenario** from the *MenuBar* to open the *Select Scenario* dialog.
3. Choose a scenario from the dropdown and click **OK** to start the scenario in *Editor* mode.
4. To modify the scenario, select **Mode > Editor** from the *MenuBar*, then use the *Tool Ribbon* and/or *Asset Library* to edit the scenario.
    - Save modifications by selecting **File > Save Scenario As.**
        - Please see notes on *scenario names*.
        - Note that it is recommended to always use a different name from any of the existing content so there is no confusion between existing and custom content.
5. To start dynamic simulation, select **Mode > Simulator** from the *MenuBar*.

To quickly start building a new VROV scenario:

1. Double-click the  (**iDEA-DT** icon) on the Desktop.
2. Select **File > New** from the *MenuBar* to open the *Select Terrain* dialog.
3. Choose an existing terrain from the dropdown and click **OK** to start a new scenario with the selected terrain in *Editor* mode.
4. Objects can be added to the scenario from the *Asset Library*.
    - From the library, either double-click the desired object or drag it from the library into the *Viewport*
5. When the scenario is complete, save it by selecting **File > Save Scenario** or **File > Save Scenario As.**
    - Please see notes on *scenario names*.
    - Note that it is recommended to always use a different name from any of the existing content so there is no confusion between that and any custom content.
6. To start dynamic simulation, select **Mode > Simulator** from the *MenuBar*.

To copy all custom scenarios from the iDEA-DT to the VROV Simulator:

1. Double-click the  (**iDEA-DT** icon) on the Desktop.
2. Select **Simulator > Update** from the *MenuBar*.

1.3 Definitions

Below are definitions for some of the terms that will be encountered in this document:

GRi Simulations Inc. (GRi)

- Developer of the iDEA (Interactive Design, Engineering and Analysis) line of software products, which consists of 3D, interactive data visualization and simulation software tools for offshore assets, projects, and their associated operations, providing users with a digital "sandbox" for rapid, informed investigation and decision making.

iDEA-DT

- Interactive Design, Engineering and Analysis - Digital Twin.
- The iDEA-DT is optimized for integrating and visualizing historical and real-time data from multiple sources in a common, interactive 3D interface.

1.4 Restriction of Use

Restriction on Use, Publication, or Disclosure of Proprietary Information

This document contains information proprietary to GRi SIMULATIONS INC., to its subsidiaries or to a third party to whom GRi SIMULATIONS INC. may have a legal obligation to protect such information from unauthorized disclosure, use or duplication. Any disclosure, use or duplication of this document, or of any of the information contained herein, for other than the specific purpose for which it was disclosed is expressly prohibited, except as GRi SIMULATIONS INC. may otherwise agree to in writing.

2 iDEA-DT User Interface

The iDEA-DT's user interface is similar to most Windows-based applications. The application window is divided into 5 sections (as shown below):

Title Bar

Menu Bar

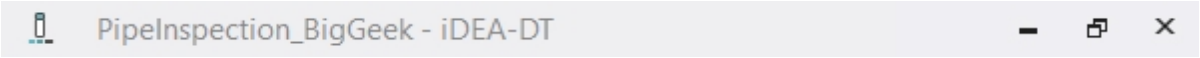
Tool Ribbon

Viewport

Status Bar

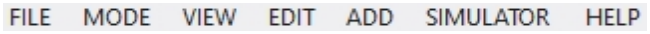
2.1 Title Bar

The ***Title Bar*** displays the application icon, the name of the currently opened scenario, and the title of the application on the left, as well as controls to *Minimize*, *Maximize* and *Close* the application window on the right.



2.2 MenuBar

The ***Menu Bar*** displays menus which provide access to many of the iDEA-DT application's available functions. The menu options depend on the currently selected *mode*.

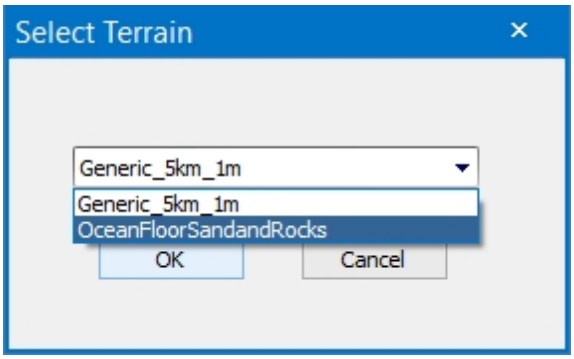


2.2.1 File Menu

The ***File Menu*** contains functions for opening, closing, and saving files.

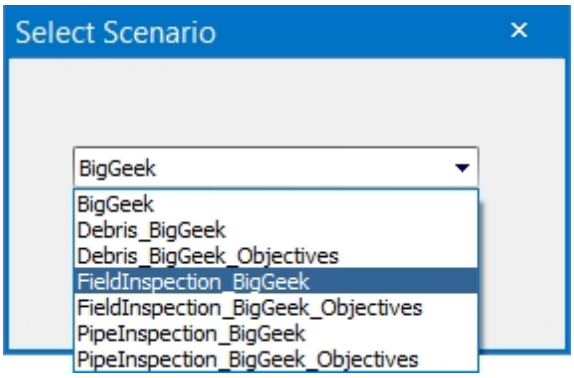
New

- Selecting *New* will start a new, empty scenario. A terrain must be selected before the new scenario will be loaded into the *Viewport*. If there are multiple terrain files available, a dialog box will appear in which the user can select the desired terrain file. If only a single terrain file is available it will be automatically loaded into the new scenario.



Open Scenario

- Selecting *Open Scenario* will allow the user to open any scenario that has been saved previously from the *Select Scenario* dialog.



Open Shapefile

- Selecting *Open Shapefile* will allow the user to create a new scenario that includes the data from the selected GIS shapefile. Before the shapefile data can be loaded into the scenario, a terrain must be chosen from the Select Terrain Dialog, described above. The selected terrain should be in

the same general area as the shapefile being opened, but this is not absolutely necessary.

Open Geodatabase

- Selecting *Open Geodatabase* will allow the user to create a new scenario that includes the data from the selected GIS geodatabase. Before the geodatabase data can be loaded into the scenario, a terrain must be chosen from the Select Terrain Dialog. The selected terrain should be in the same general area as the shapefile(s) in the geodatabase being opened, but this is not absolutely necessary.

Open Log File

- Selecting *Open Log File* will allow the user to select and open any simulation log files that are available. Log File playback will begin immediately after the scenario loads in the *Viewport*.

Close

- Selecting *Close* will close the currently loaded scenario. If changes have been made to the scenario since it was opened, the user will be prompted to save the scenario so the changes are not lost.

Save Scenario

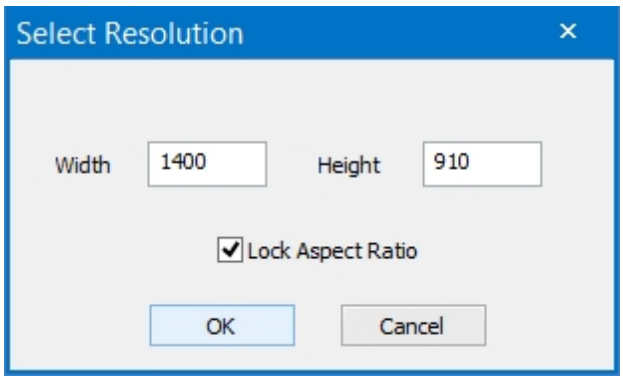
- Selecting *Save Scenario* will allow the user to save the currently loaded scenario. This function will overwrite the last saved version of the currently loaded scenario, saving any changes that have been made since it was opened. If the current scenario has never been saved, the user will be prompted to enter a scenario name.

Save Scenario As

- Selecting *Save Scenario As* will allow the user to enter a new name for and save the currently loaded scenario. This function is useful if the user does not want to lose the original version of the scenario that was loaded prior to making changes.

Save Screenshot

- Selecting *Save Screenshot* will allow the user to capture a screenshot of the current Viewport configuration. Before the screenshot is saved, the user will be prompted to enter the desired resolution in the *Select Resolution* dialog. Users are able to capture large screenshots (much larger than the on-screen resolution) for printing purposes, etc.



Import Shapefile

- Selecting *Import Shapefile* will allow the user to browse to a directory, select a GIS shapefile, and load the shapefile into the currently loaded scenario.

Import Geodatabase

- Selecting *Import Geodatabase* will allow the user to select and import an ESRI GIS Geodatabase file/folder into the currently loaded scenario.

Import Terrain

- Selecting *Import Terrain* will allow the user to import a terrain file (XYZ or TXT format) and convert it to GRi's proprietary format. This function will add the new terrain to the list of available terrain files in the *Terrain Selection dialog*.

Import Point Cloud

- Selecting *Import Point Cloud* will allow the user to import Point Cloud data into the scenario.

Import DWF

- Selecting *Import DWF* will allow the user to import a DWF file, usually containing field layout information, into the scenario.

Export Shapefile

- Selecting *Export Shapefile* will allow the user to export a shapefile containing either point or line data, reflecting the 3D models (points) and lines in the currently loaded scenarios. The user will be prompted to select either Lines or Points as the shapefile data type prior to export.

Exit

- Selecting *Exit* will exit the application. If changes have been made to the scenario since it was opened, the user will be prompted to save the scenario so the changes are not lost.

2.2.2 Mode Menu

The ***Mode Menu*** contains options for switching the IDEA-DT between *Simulator*, *Editor*, Player, and *Visualization* modes.

Simulator

- Selecting *Simulator* mode will enable the simulation physics, allowing any dynamic objects in the scenario to move and interact with the environment in a realistic manner. In this mode it is possible to control ROVs and other equipment to complete simulated operations, perform ROV accessibility testing, and test scenarios designed for the VROV Simulator.
- There is also the option of replaying any log files recorded in this mode, as opposed to switching to *Player* mode.
    - When replaying a log file in this mode, *Tool Ribbon* buttons with mode-specific functions behave as designed for *Player* mode.

Editor

- In *Editor* mode the user is able to add or remove objects and reposition or reorient any objects in the scenario. This mode also allows importing of GIS files and other data types.
- This is the default mode for the *iDEA-DT*.

Player

- *Player* mode allows playback of any log files recorded in *Simulator* mode.

Visualization

- *Visualization* mode allows playback of previously recorded or real-time positioning data from real-world (non-simulated) events.
- To enable *Visualization* mode, ensure that RTV is selected in the *View* menu.
- Note that this option may not be available if the RTV plugin is not configured.

2.2.3 View Menu

The ***View Menu*** (shown below) contains functions for toggling the visibility of various User Interface elements.

Explorer

- Selecting *Explorer* will toggle the visibility of the *Scenario Explorer*.

Controls

- Selecting *Controls* will toggle the visibility of the *VROV Simulator ICC Command Dialog* for use in *Simulator Mode*.

Properties

- Selecting *Properties* will toggle the visibility of the *Properties Panel*.
- This dialog displays different parameters depending on the element selected.

Browser

- Selecting *Browser* will toggle the web browser functionality of the iDEA-DT, showing web pages relevant to the scenario content.

Asset Library

- Selecting *Asset Library* will toggle the visibility of the *Asset Library*.

RTV

- Selecting *RTV* will toggle the visibility of Real-Time Visualization components in the scenario.

Status Bar

- Selecting *Status Bar* will toggle the visibility of the *Status Bar*.

Viewport Menus

- Selecting *Viewport Menus* will toggle the visibility of the *Viewport/Camera Settings Menu*, *Object Selection Menu*, and *Screen Settings Menu*.

2.2.3.1 Command Dialog

The ***Command Dialog*** contains a set of controls for elements in dynamic simulations as well as a selection of options for the simulated environment.

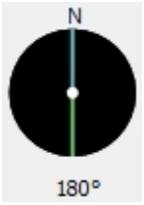
The ***Settings*** button (⚙) provides the user options to view *Aerial Camera Settings* and the *About* information, including links for online support, general information about GRi, or VROV licensing.

The ***Controls*** section allows the user to control movement, rotation, and the paying in/out of various elements of a simulation. Depending on the type of object selected, some control options may be inactive (the entire section may be hidden if the currently loaded scenario does not contain elements controllable by this feature).

Control Selection Dropdown

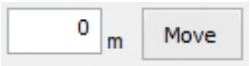
- A dropdown menu that displays all items controllable in the currently running scenario.

Heading Display



- A circle with lines indicating the selected object's current and set headings.
  - The green line indicates the current heading of the selected object.
  - The blue line indicates the set heading of the object (heading selectable by clicking within the area of the circle, or by typing into the Set Heading entry box).
- Below the circle display is the numerical value of the heading displayed in degrees.

Position Control



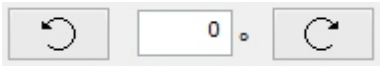
- Includes an entry box (default value of 0 meters), followed by a *Move* button.
- To move the selected object:
  1. Choose a heading at which to move the object by either:
     - clicking within the area of the heading display circle,

     or
     - typing a heading in the Set Heading box.
  2. Enter a distance (in meters) to move the object at the selected heading in the entry box.
     - If a value of 0 is used, no limit will be placed on the position (the object will continue to move until it is manually stopped).
  3. Click the *Move* button to begin repositioning the object.
     - While the object is in motion, the entry box will display the distance remaining to the specified distance.
     - While the object is in motion, the text on the *Move* button will change to *Stop*. Motion may be stopped at any time by clicking *Stop*.

Set Heading 

- Includes an entry box (default value displays the current heading of the object), followed by a *Rotate* button.
- To rotate the selected object:
  1. Choose a heading at which to set the object by either:
     - clicking within the area of the heading display circle,

     or
     - typing a heading in the entry box.
  2. Click the *Rotate* button to begin rotating the object.
     - While the object is rotating, the Rotation Control entry box will display the number of degrees remaining to the specified heading.
     - While the object is rotating, the text on the *Rotate* button will change to *Stop*. Rotation may be stopped at any time by clicking *Stop*.

Rotation Control 

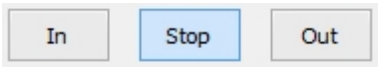
- Includes an entry box (default value of 0 degrees), as well as counter-clockwise and clockwise rotation buttons.
- To rotate the selected object:
  1. Enter an amount (in degrees) to rotate the object.
     - If a value of 0 is used, no limit will be placed on the rotation (the object will continue to rotate until it is manually stopped).
  2. Click either the Counter-Clockwise button or the Clockwise button to begin rotating the object.
     - While the object is rotating, the entry box will display the number of degrees remaining.
     - Rotation may be stopped at any time by clicking the same directional button that started the rotation.

Depth/Length Control

- Depending on the type of object selected, the depth/length control may have slightly different options:
  - **Configuration 1:** 

    - Includes an entry box (default value of 0 meters), as well as *In* and *Out* buttons.
      - The *In* button moves the object closer to the ocean surface (or shortens a tether/umbilical).
      - The *Out* button moves the object farther from the ocean surface (or extends a tether/umbilical).
    - To modify the depth/length of the selected object:
      1. Enter an amount (in meters) to modify the depth/length.
         - If a value of 0 is used, no limit will be placed on the movement (the object will continue to move until it is manually stopped, or until it reaches its minimum or maximum depth/length).
      2. Click either the *In* or the *Out* button to begin moving the object.
         - While the object is in motion, the entry box will display the distance/length remaining.

- Motion may be stopped at any time by clicking the same directional button that started the motion.

- **Configuration 2:** 

  - Includes *In*, *Out*, and *Stop* buttons.
    - The *In* button moves the object closer to the ocean surface (or shortens a tether/umbilical).
    - The *Out* button moves the object farther from the ocean surface (or extends a tether/umbilical).
    - The *Stop* button immediately stops movement.
  - To modify the depth/length of the selected object:
    1. Click either the *In* or the *Out* button to begin moving the object.
       - Motion may be stopped at any time by clicking the *Stop* button.
       - There is no limit on the movement (the object will continue to move until it is manually stopped, or until it reaches its minimum or maximum depth/length).

Speed

- A slider that modifies the speed of movement and rotation of the selected object.
- It acts as a scale, where the full-left position indicates minimum (0%) of the predefined speed of motion/rotation, and full-right position indicates the maximum (100%) of the predefined speed of motion/rotation.

Follow

- The *Follow* button turns on the function of following another object, as predefined in the simulation.
  - This is generally used on a ship to have it follow the ROV.
- When the *Follow* function is enabled, it may be disabled by clicking the *Follow* button again.
- This button may be inactive if:
  - The selected object has not been preassigned an object to follow.
  - The *Follow* function has been designated as always on for the currently running scenario, which does not allow it to be disabled.

The ***Ocean Environment*** settings allow the user to choose specific environmental conditions (above or below the ocean surface) to mimic a real-world scenario, or to adjust the difficulty of the task(s) required.
These settings can be modified before a scenario is started or in real-time during the simulation:

Time of Day

- A slider, which changes the time of day, and consequentially, the lighting of the selected *Scenario*.

Fog

- A slider, which changes the fog cover of the selected *Scenario* as a percentage.

Rain

- A slider, which changes the amount of rain in the selected *Scenario* as a percentage.

Water Visibility

- A percentage of visual clarity for virtual cameras (excluding the *Aerial* and *Map* views).
  - 0% presents an environment with the maximum amount of suspended particles.
  - 100% presents a virtually perfect view of the undersea environment through the cameras.

Sonar Noise

- Relative amount of acoustic noise that appears on the VSonar display.
  - 0% represents no sonar noise.
  - 100% represents a maximum amount of sonar noise.

Beaufort

- Sea state, as indicated by the Beaufort scale.
- The simulated environment accounts for Beaufort numbers up to 6.
  - 0 - Calm (wave height 0m).
  - 1 - Light Air (wave height 0m - 0.2m).
  - 2 - Light Breeze (wave height 0.2m - 0.5m).
  - 3 - Gentle Breeze (wave height 0.5m - 1m).
  - 4 - Moderate Breeze (wave height 1m - 2m).
  - 5 - Fresh Breeze (wave height 2m - 3m).
  - 6 - Strong Breeze (wave height 3m - 4m).
- This option is not visible if the simulated environment for the selected scenario has no Beaufort available (wave height of 0m).

Current Speed

- Speed, in knots, of the ocean current.
- The simulated environment accounts for current speeds up to 2 knots.
- This option is not visible if the simulated environment for the selected scenario has a specified constant current.

Current Direction

- Direction, in degrees, of the ocean current.
  - 0° indicates North
  - 90° indicates East
  - 180° indicates South
  - 270° indicates West
- This option is not visible if the simulated environment for the selected scenario has a specified constant current.

2.2.4 Controls Menu

The ***Controls Menu*** contains an option for toggling controls between USB joysticks and defined plugins (ex: VROVComms).

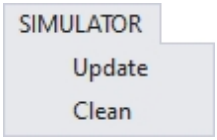
Note that controls may not be toggled while in *Simulator* mode.

2.2.5 Edit Menu

The ***Edit Menu*** contains functions for modifying parameters of the *Aerial* camera. Selecting *Aerial Camera* will open the *Aerial Camera Settings Dialog*.

2.2.6 Simulator Menu

The ***Simulator Menu*** provides functions for updating the full *Simulator* with modifications made to the scenarios in the *iDEA-DT*.



Update

- Updates and adds files from the *iDEA-DT* to *Simulator* modules.

Clean

- Removes files from the *Simulator* modules that are not in the *iDEA-DT* module.

2.2.7 Help Menu

The ***Help Menu*** displays options to open the *iDEA-DT Manual* (this document) or view the *About* information, including links for online support, general information about GRi, or VROV licensing.

2.3 Tool Ribbon

The ***Tool Ribbon*** contains tools for creating and modifying scenarios. The contents of the ***Tool Ribbon*** may vary depending on the element selected in the *Viewport* or *Explorer*.

The left-hand side of the ***Tool Ribbon*** displays a selection of tools for scenario creation and editing, including the *Select ( )*, *Measure ( )*, *Move ( )*, and *Line ( )* Tools.

- See descriptions of these tools in the following sections.

Following the tool buttons, there is set of tools for scenario and log file recording and playback. These items are described *here*.

Next, in *Editor* mode only, there are a series of information and editing boxes and tools relevant to the currently selected object/element. This section is described *here*.

The right-hand side of the ***Tool Ribbon*** displays a collection of buttons to show/hide specific UI elements, including the *Explorer ( )*, *Info* ( ), *Asset Library ( )*, *Properties ( )*, *Browser ( )*, and *Aerial Camera Settings ( )*.

- See descriptions of these elements in the following sections.

2.3.1 Select Tool

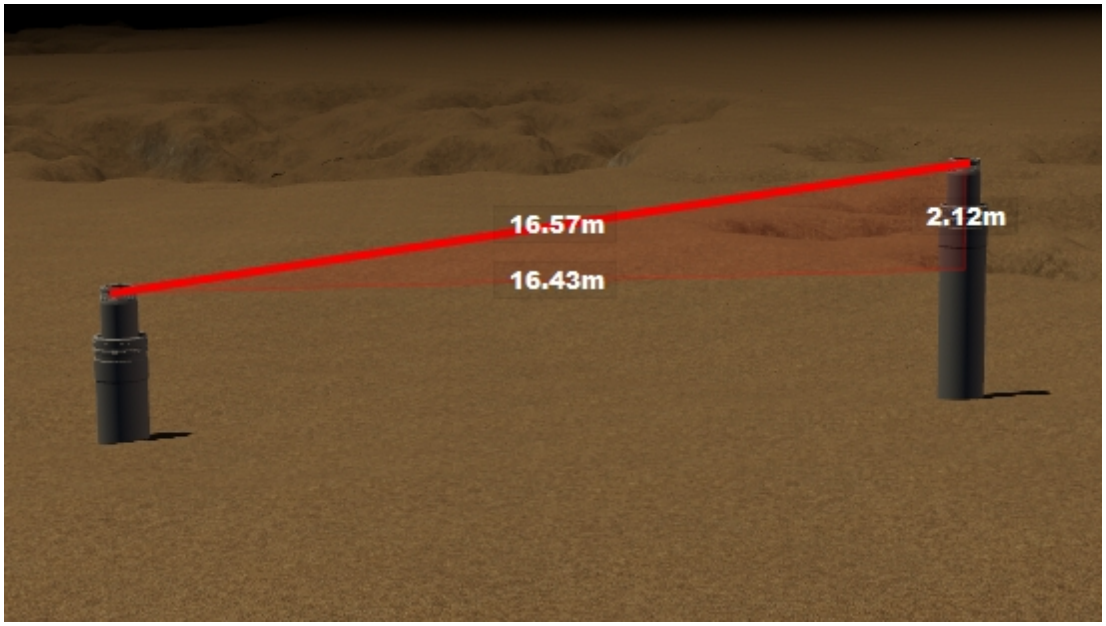
The ***Select Tool*** allows the user to select objects in the scenario. Double-clicking an object in the *Viewport* while this tool is active will focus the *Aerial* and *Map* cameras to that object. This tool is enabled by default when a scenario is loaded.

2.3.2 Measure Tool

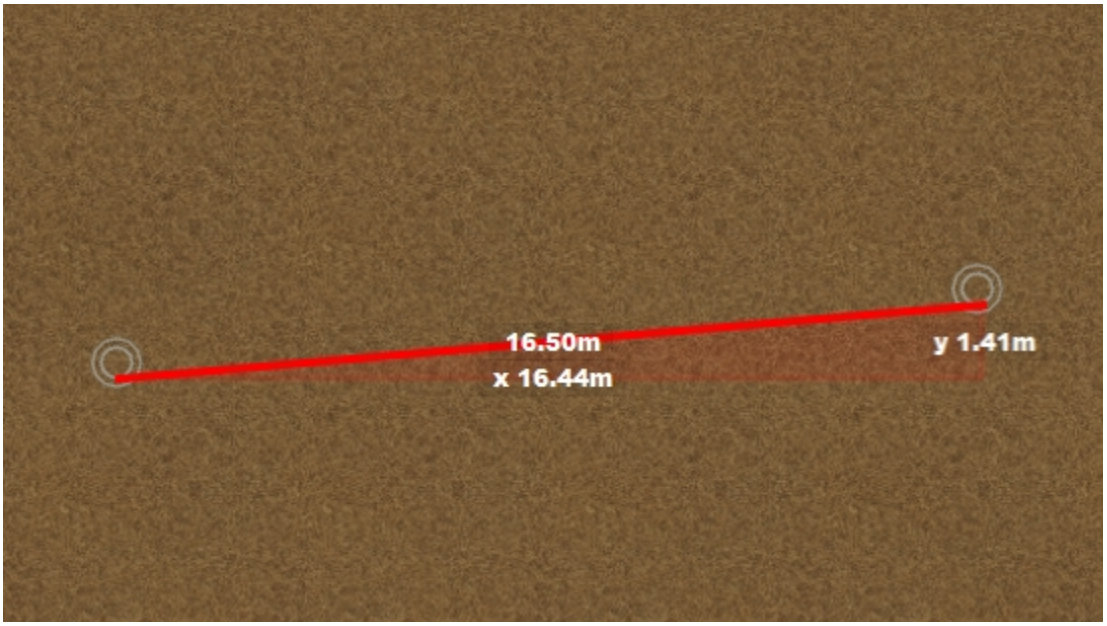
The ***Measure Tool*** allows the user to measure the distance between any two points of geometry in the currently loaded scenario. When enabled, the first mouse click on a piece of 3D geometry will define the first point, and the second click will define the second point. The two points are connected by a thick red line in the *Viewport*.

By default, the terrain is not selectable as a point of measurement. This is to allow the user to reposition and reorient the camera without accidentally clicking on the terrain. To use the terrain for a measurement point, hold the *Ctrl* button while clicking the terrain.

In the *Aerial* view, the center of the thick red connecting line displays the length in 3D space (accounting for X, Y, and Z axes). There are 2 additional lines displayed that indicate the horizontal (X and Y axes) and vertical (Z axis) distances between the points.



In the *Map* view, the center of the thick red connecting line displays the horizontal length (accounting for X and Y axes) between the points. There are 2 additional lines displayed that indicate the X and Y distances individually.



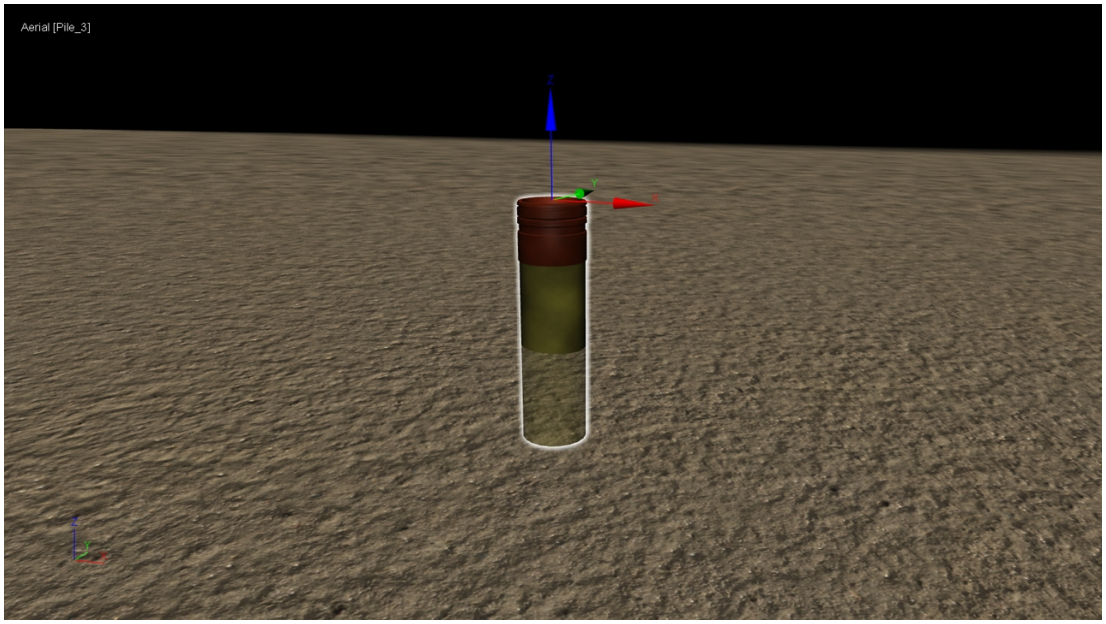
2.3.3 Move Tool

The ***Move Tool*** allows the user to change the position of any object in the scenario. Selecting an object in the *Viewport* while the ***Move Tool*** is enabled will show the *XYZ Translate Gizmo* and outline the object. Users may click and drag an object to move it laterally or click and drag the *Translate Gizmo* to restrict movement along the selected axis. The *Coordinate System Toggle* defines whether the object is moved in relation to the default scenario X,Y,Z axis or the X,Y,Z orientation of the selected object.

Before they can be moved, objects must be unlocked by clearing the *Lock* on the *Tool Ribbon*. Objects may be locked again using the button on the *Tool Ribbon* or by saving the scenario either from the *File Menu* or by

pressing <*Ctrl*+*S*> on the keyboard.

While using the ***Move Tool***, the terrain is semi-transparent to aid in cases where part or all of an object is located below the terrain – occasionally, when importing *GIS* files that are linked to equipment models, the models are imported to positions below the terrain.

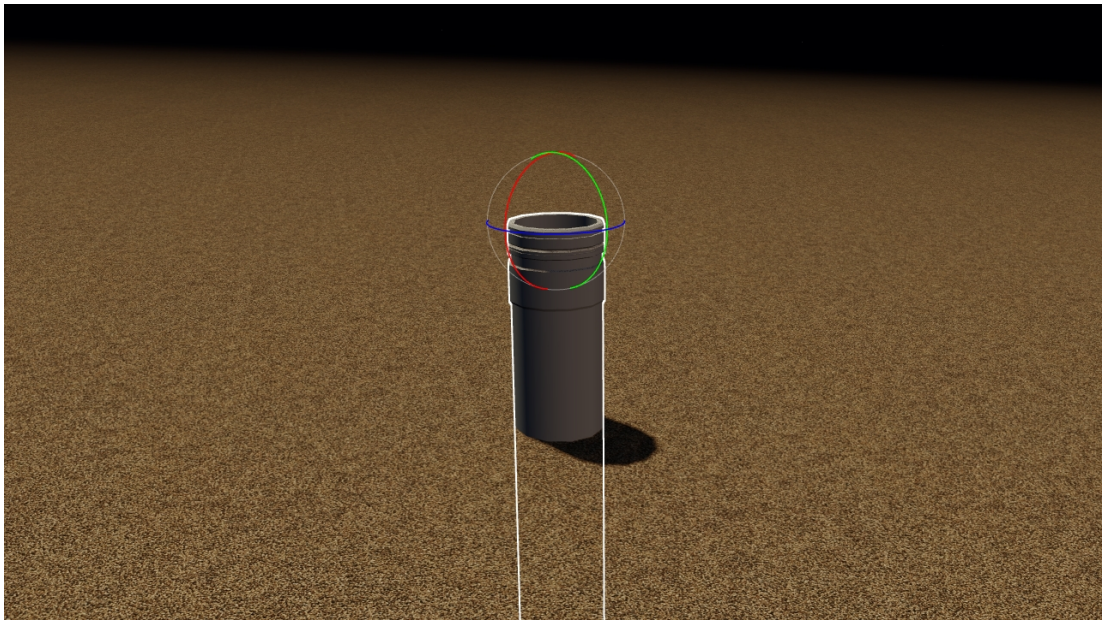


Alternative to using the *Move Tool*, positions may be edited using the *text boxes on the Tool Ribbon*.

2.3.4 Rotate Tool

The ***Rotate Tool*** allows the user to change the orientation of any object in the scenario. Selecting an object in the *Viewport* while the ***Rotate Tool*** is enabled will show the *XYZ Rotate Gizmo* and outline the object. Users may click and drag the *Rotate Gizmo* to rotate the object around the selected axis. The *Coordinate System Toggle* defines whether the object is rotated in relation to the default scenario X,Y,Z axis or the X,Y,Z orientation of the selected object.

Before they can be rotated, objects must be unlocked by clearing the *Lock* on the *Tool Ribbon*. Objects may be locked again using the button on the *Tool Ribbon* or by saving the scenario either from the *File Menu* or by pressing <*Ctrl*+*S*> on the keyboard.



Alternative to using the ***Rotate Tool***, orientations may be edited using the *text boxes on the Tool Ribbon*.

2.3.5 Line Tool

The ***Line Tool*** allows the user to create a 3D line shape in the virtual environment. This tool is only available in *Editor* mode.

Selecting the ***Line Tool*** changes the *Properties Panel* to display options for creating new lines. Once activated, the tool is immediately available to create lines in the *Aerial* or *Map* views. Detailed instructions for line creation can be viewed *here*.

Line Type

- The **Line Type** dropdown displays a list of available preexisting line types.
- The + (**Add Line Type** button) is used to create new line types with individual specified properties.
  - Clicking the + button opens a dialog to provide a name for a new line type.
  - After the name for the new line type is entered, it is automatically selected in the *Line Type* dropdown and its properties are displayed.
    - Note that the *Properties* panel will appear unchanged when first creating the new line type. This is because the new line type takes on all the properties of the type currently selected in the *Line Type* dropdown.
  - The type for any line may be changed after the line has been created.
- The X (**Remove Line Type** button) is used to remove line types.
  - Note that removing a line type will affect all scenarios that include a line of that type.

Radius

- Visual radius of the line.
- Measured in meters.

Node Scale

- Defines the size of the nodes (spheres at each point in the line used as handles when editing the line).
- The size is defined as a scale in proportion to the radius of the line.
  - Node Scale of 1 produces spheres the same radius as the cable.

Z Offset

- Vertical distance (in meters) to offset the Line from the terrain when it is created.
  - When a value of 0 is used, the Line is created with the center point of its cross-section at the level of the terrain (half of the line is above the terrain and half below).
- Using a value equal to the radius would set the Line directly on top of the terrain.
  - Typically, it is recommended to use a value between 0 and the radius (closer to the radius). This would put the Line mostly on top of the terrain but suggest some sinking in or sediment buildup at the base of the Line.

Color

- Displays a color picker in the form of both a color wheel/swatch selection and custom color definitions using RGB (Red, Green, Blue) or HSL (Hue, Saturation, Luminance).
- If the selected type has a texture defined, the Color swatch will be white.

Visual Parameters

- The visual parameters of the material on the Line.
  - **Diffuse**
    - Amount of color to apply from the defined color of the cable.
    - Values range from 0 to 1.
      - 0 - The Line appears black (no light reflected), regardless of the color or texture defined.
      - 1 - The color defined is fully visible.
  - **Specular**
    - Amount of specularity (shininess) of the cable.
    - Values range from 0 to 1.
      - 0 - No specular highlight.
      - 1 - Brightest specular highlight.
  - **Shininess**
    - Sharpness of specular highlight on the cable.
    - Values range from 0 to 1.
      - 0 - Flat, washed out highlight.
      - 1 - Round, sharp, nearly pinpoint highlight.

Surface

- Assigns a dynamic surface to the Line, which determines the physical properties of the surface when interacting with other objects.

Length

- Displays the length of the currently selected Line (or line in progress).
- Note that the length of the Line updates when activating/deactivating the *Use Spline* checkbox and by making end connections using the red spheres at the end of the Lines.

Min Radius

- Displays the minimum radius of the currently selected Line (or line in progress).
- Note that this display is inactive if the *Use Spline* checkbox is inactive.

Use Spline

- Specifies the visual smoothness of the currently selected Line (or line in progress).
- When this checkbox is inactive, the Line has straight segments with sharp corners.
- When this checkbox is activated, the Line is a continuous curve.
- This checkbox may be activated before, during, or after Line creation.

2.3.6 Scenario and Replay Tools

The scenario and replay tools are used for log file recording and playback, as well as video recording and some *Mode* switching operations.

Record Start/Stop Button (/)

- This button has two modes - *Log file* and *Video.* The mode is determined by the *Mode* or the dropdown next to the button.
  - Log file recording is available in Simulator mode only.
  - Video recording is available in all modes.
- Prior to beginning a recording, the button is displayed as (Start Recording Video) or (Start Recording Log File).
  - Begins recording the scenario in progress.
  - Before the recording commences, a file name will be requested. The default file name provided is the current date and time.
- While a recording is in progress, the button is displayed as (Stop Recording Video) or (Stop Recording Log File).
  - Stops the recording in progress.
- The dropdown next to the record button displays the following options:
  - *Record to Log File* and *Record to Video File*
    - Determines whether the *Record Start/Stop Button* produces a log file or a video.
      - These menu items are dependent on each other, where the activation check (✓) may only be next one or the other. Activating one disables the other.
    - These options are not visible in *Editor* and *Player* modes since it is not possible to capture a log file in these modes. Therefore, the button automatically switches to video mode.
  - *Record Interface*
    - Determines which user interface elements are recorded when recording a video.
      - When enabled, the recorded video includes the *Viewport*, as well as the *Tool Ribbon*, *Explorer*, *Info popup*, *Asset Library*, *Properties Panel*, *Browser*, *ICC Command Dialog*, and mouse pointer.
      - When disabled, the recorded video includes the *Viewport* only.
  - *Open Video Folder*
    - Opens the Windows Explorer to the location of saved videos.

Play/Pause Button (/)

- This button has different functions, depending on the currently selected *Mode*:
  - In *Editor* mode, the button switches to *Simulator* mode.

- In this mode, only *Play* ( ) is available - *Pause* ( ) will not be displayed..
- In *Simulator*, *Player* (with a log file selected), and *Visualization* modes, the button begins/ pauses the currently selected scenario's simulation/log file/visualization.

Stop Button ( )

- This button has different functions, depending on the currently selected *Mode*:
  - In *Simulator* mode (with dynamic simulation running), the button switches to *Editor* mode.
  - In *Simulator* and *Player* modes (with a log file selected), the button stops the currently running simulation/log file and returns the Time Slider to the start position..

Seek Buttons - Reverse ( ) / Fast Forward ( )

- These buttons are active only in *Simulator* and *Player* modes with a log file selected.
  - If no log file is selected, the buttons are still visible, but inactive (greyed out) in these modes.
- When the *Fast Forward* ( ) button is activated, the log file plays at 2x speed.
- When the *Reverse* ( ) button is activated, the log file plays in reverse at 2x speed.

Log File Dropdown

- The *Dropdown List* is visible only in *Simulator* and *Player* modes.
- In *Simulator* mode, the default option is *Simulation*, which enables the simulation physics, allowing any dynamic objects in the scenario to move and interact with the environment in a realistic manner.
  - If log files exist for the currently loaded scenario, those log files will populate the drop down list below *Simulation*.
- In *Player* mode, the default option is *Default*, which sets the currently loaded scenario to its initial static loading state.
  - If log files exist for the currently loaded scenario, those log files will populate the drop down list below *Default*.

Time

- The *Time* indication area consists of a numerical time value (0:00:00), representing hours:minutes:seconds, as well as a time slider with *Time Position Indicator* ( ).
- In *Simulator* mode with dynamic simulation running, the numerical time value indicates the amount of time from when the dynamics/physics were started.
- In *Player* mode with a log file selected, the numerical time value indicates the current position of the *Time Position Indicator*.
  - This value may not begin at 0:00:00 if the recording did not begin at that time.
- The *Time Position Indicator* displays the current position between the beginning and end of the recorded log file.

2.3.7 Information and Editing Tools

In *Editor* mode, the following items are displayed in the *Tool Ribbon* to aid in editing scenarios.

Positional and Rotational Information

- This set of entry boxes and buttons offers information about the currently selected object/element, including X, Y, and Z positional and rotational data.
- When an object is selected, its current position and rotation are displayed in text boxes.
  - When the object is *locked* (either manually or after loading a scenario), these boxes are used for display only. The values may not be edited.

- When the object is *unlocked*, new values may be entered in the boxes. The new value is applied after pressing *Enter*.
- If the *Coordinate System Toggle* is set to *Local*, then the values in the boxes will be all zeros. New values may be entered in the boxes, which are applied after pressing *Enter*.

- Objects may be moved or rotated using the axis labels for the position and rotation boxes.

Coordinate System Toggle (/)

- This button specifies the orientation in which an object may be edited using the position and rotation boxes, *Move Tool*, or *Rotate Tool*.
- *Global Coordinates ( )*
  - By default, objects are moved and rotated in the *Global Coordinate System*, meaning the default scenario X,Y,Z orientations.
- *Local Coordinates ( )*
  - When activated, objects are moved and rotated in the *Local Coordinate System*, meaning it uses the X,Y,Z orientation of the selected object.
  - When activated, the values in the position and rotation boxes are all zeros. New values may be entered in the boxes, which are applied after pressing *Enter*.

Lock/Unlock Button (/)

- This button toggles whether the selected object is fixed in place or movable.
  - Existing scenario objects are locked on scenario load.
  - New objects are unlocked when first added to the scenario.
  - Unlocked objects are automatically locked by saving the scenario.

2.3.8 Explorer

The ***Explorer*** displays a categorical list of all items included in the currently loaded scenario. It may be enabled from the icon in the *Tool Ribbon* ( ) or from the *View Menu*. This dialog is docked to the left side of the *Viewport* by default, but may be pulled away using its title bar and docked to the right side.

The ***Explorer*** can be used to select the different elements of the scenario. Object types and menus are searchable through the search box, located at the top of the ***Explorer***, immediately to the left of the ***Explorer*** icon ( ). Additional properties of objects are editable by clicking them in the ***Explorer***.

Most elements have right-click menus that enable different functions for that type:

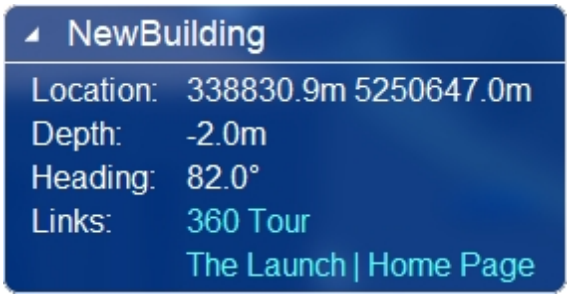
- Right-clicking the *Terrain* in the ***Explorer*** provides an options to *Show Properties* (open the *Properties Panel*, if not already open), which contains settings to customize the appearance of the terrain.
- Right-clicking on a *Platform*, *Static,* or *Moveable Object* in the ***Explorer*** provides options to *Show Properties* (open the *Properties Panel*, if not already open), *Add* (or *Edit*) *Info Tag*, *Rename*, *Group*, *View Attributes* (GIS attributes related to the object, if GIS data exists in the scenario with links to the selected object), *Link File*, and *Link URL* to the object for data management purposes.
- Right-clicking a *Line Object* in the ***Explorer*** provides options to *Add* (or *Edit*) *Info Tag* or *View Attributes* (GIS attributes related to the line, if applicable).
- Right-clicking a *Jumper Object* in the ***Explorer*** provides options to *Add* (or *Edit*) *Info Tag, Group*, or *Rename* the jumper.
- Right-clicking a *GIS geodatabase* in the ***Explorer*** provides options to *Lock to Objects* (toggles the locking of any GIS data symbols to their respective 3D objects so they can be moved together or independently), *Export* (exports the GIS file reflecting any changes that have been made to the data

within the iDEA-DT application), *Show All*, and *Hide All* (show or hide all the layers of the selected geodatabase).

- Right-clicking the *Terrain* in the ***Explorer*** provides options to *Rename*, *Color*, *Add Group*, and *Add* (or *Edit*) *Info Tag*. Group creation and editing is described *here*.

2.3.9 Info

Enabling the ***Info*** display opens a pop-up window in the Viewport attached to the currently selected object or element. The ***Info*** pop-up displays the name of the object and InfoTag (if assigned) in the title of the pop-up. The expanded lower section of the pop-up includes Location (X and Y position), Depth, Heading, Links, and Files.



2.3.10 Asset Library

The ***Asset Library*** displays a selection of items that may be added to the currently loaded scenario. It may be enabled from the icon in the *Tool Ribbon* ( ) or from the *View Menu*. This dialog box is docked to the right side of the *Viewport* by default, but may be pulled away using its title bar and docked to the left side. The dialog may be expanded from a single column to any number up to 5 columns by click-dragging the edge of the dialog. Items within the ***Asset Library*** are categorized by type. Each category may be collapsed or expanded to hide/ show all items within that category.

To include items from the ***Asset Library*** in the currently loaded scenario, either:

1. Double-click the asset to add it directly in front of the current camera view.

or

2. Drag and drop the asset into the *Viewport*.

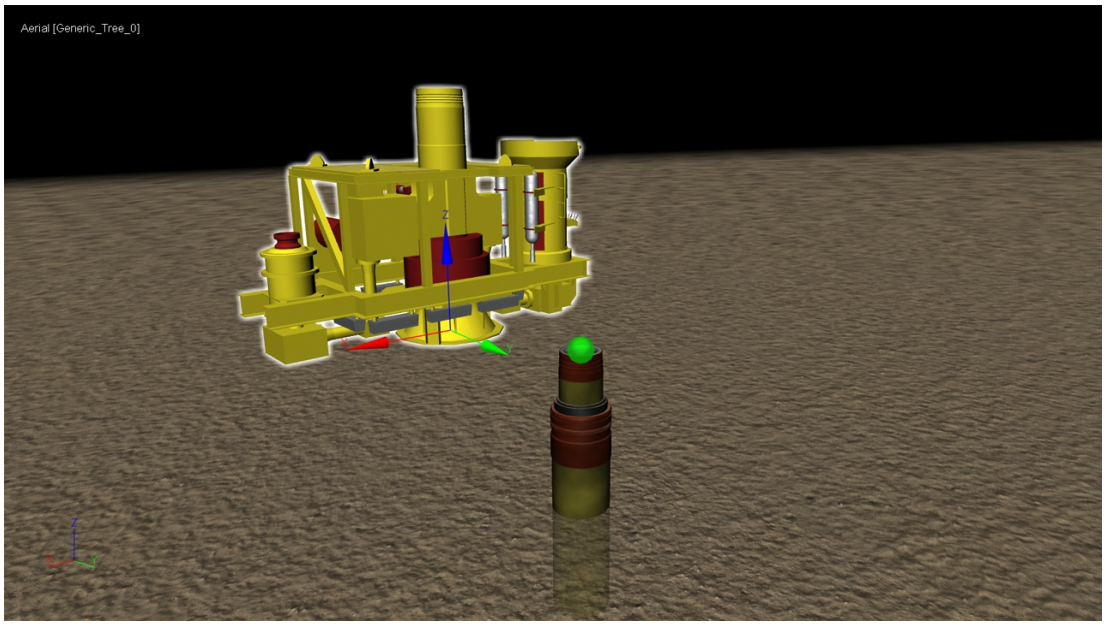
- Note that when any item is added from the ***Asset Library***, the *Move Tool* is automatically activated, allowing the user to immediately position the object as desired, including attaching it to other objects in the scenario using *Snap Points*.

After a model has been added to the scenario, its position and orientation can be modified using the *Move Tool and Rotate Tool*. The user may also input precise coordinates and set orientation values in the text entry boxes on the *Tool Ribbon.*

2.3.10.1 Snap Points

Many equipment objects have predefined connection points, or ***Snap Points***, which allow the object to be interfaced or connected with other equipment objects. When the *Move Tool* is enabled and an object is selected and *unlocked*, the possible ***Snap Point*** connections on other objects are highlighted with green spheres. Dragging the selected object onto one of these snap points will automatically snap the object to the predefined position and orientation to complete the connection. ***Snap Points*** may also be used to define connection

positions and orientations for *lines*.



After objects have been snapped together, the full assembly can be moved by selecting and moving the parent object. For example, if the user adds a wellhead, and then snaps a horizontal tree to the wellhead, then moving the wellhead will also move the horizontal tree.

2.3.11 Properties Panel

The ***Properties*** panel displays a selection of information and editable parameters for the currently selected element. This panel is docked to the right side of the application window by default, but can be pulled away using its title bar and docked to any other side of the window.

This panel may be enabled from the icon in the *Tool Ribbon* (), from the *View Menu*, or by right-clicking specific simulated elements in the *Explorer* and choosing *Show Properties*.

The panel header includes the title, an options button, and a close button.

- The title of the ***Properties*** panel describes the type of element for which properties are displayed (object, terrain, etc.) and provides the name of the element.
  - When creating a new scenario, the terrain is the default selection.
- The *Properties Lock* button (/) provides the user with an option to lock the panel contents to the current selection.
  - The purpose of this is to prevent the panel contents from changing in the event of selecting a different object/element in the *Viewport* or *Explorer* while still intending to edit the previously selected object/element.
- The *Properties Close* button ( ) closes/hides the ***Properties*** panel.

2.3.12 Browser

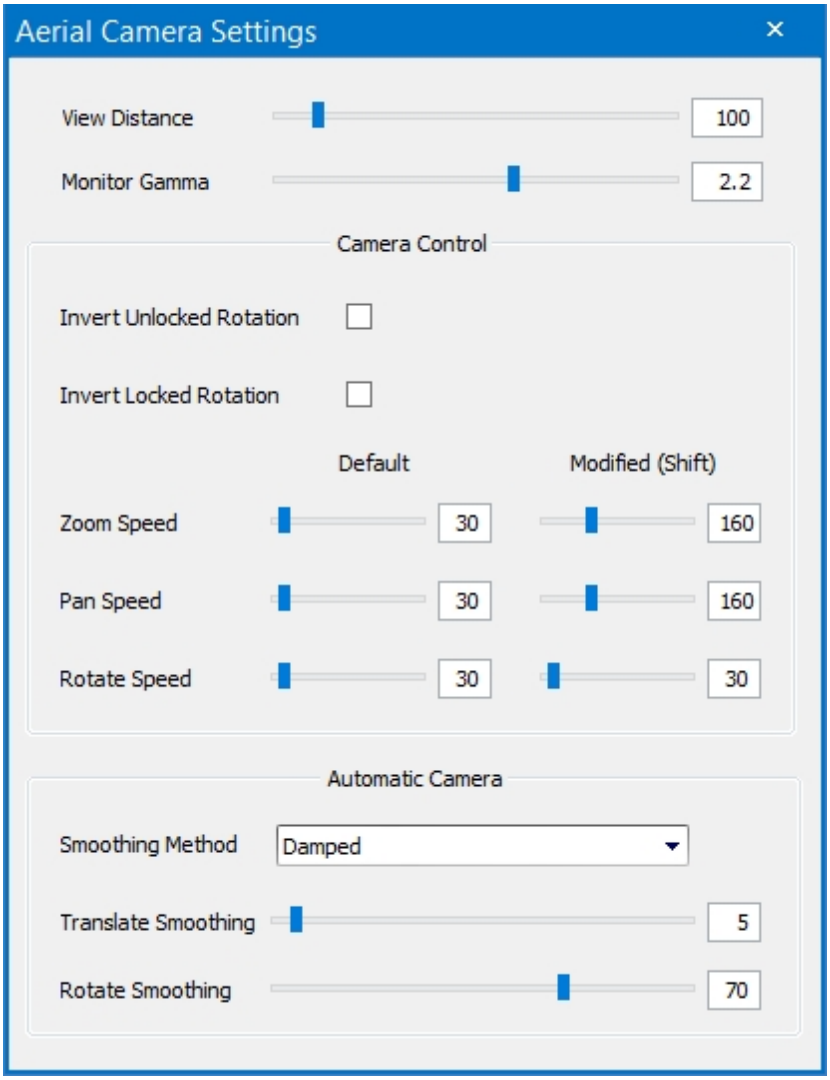
Enabling the ***Browser*** opens a new panel with an embedded internet browser. It may be enabled from the icon in the *Tool Ribbon* ( ) or from the *View Menu*. This panel is docked to the right side of the application window

by default, but can be pulled away using its title bar and docked to any other side of the window.

If the selected object has a URL attached, that URL will be displayed in the Browser. If no URL is defined for the selection, the URL defined for the scenario will be displayed. If no URL is defined for the scenario, then the Browser window will appear blank.

2.3.13 Aerial Camera Settings

The ***Aerial Camera Settings*** dialog contains options for the controls, movement, and viewing distance of the *Aerial* camera. It may be enabled from the icon in the *Tool Ribbon* ( ) or from the *Edit Menu*.



- *View Distance*
  - Sets the maximum visible distance (in meters) in the *Aerial* view.
- *Monitor Gamma*
  - Modifies the brightness of the *Aerial View* camera to accommodate different hardware specifications.
- *Camera Control*
  - *Invert Unlocked Rotation* reverses *Aerial* camera rotation with the mouse when not

locked to any object.

- *Invert Locked Rotation* reverses *Aerial* camera rotation around an object with the mouse when locked to that object.
- *Zoom Speed* changes the speed of *Aerial* camera movement when zooming using the mouse scroll wheel.
  - *Default* displays the selected *Zoom Speed* when no modifier key is used.
  - *Modified (Shift)* provides a second option for *Zoom Speed*, which is used when holding down the *Shift* key.
- *Pan Speed* changes the speed of *Aerial* camera movement when panning using the *middle mouse* button or WASD keys.
  - *Default* displays the selected *Pan Speed* when no modifier key is used.
  - *Modified (Shift)* provides a second option for *Pan Speed*, which is used when holding down the *Shift* key.
- *Rotate Speed* changes the speed of *Aerial* camera movement when rotating using the *left mouse* button.
  - *Default* displays the selected *Rotate Speed* when no modifier key is used.
  - *Modified (Shift)* provides a second option for *Rotate Speed*, which is used when holding down the *Shift* key.

- *Automatic Camera*
  - The dropdown box provides options for different smoothing algorithms for the smoothness of the *Auto Camera* movements.
  - *Translate Smoothing* changes how closely the *Auto Camera* position matches that of the object it is following.
  - *Rotate Smoothing* changes how closely the *Auto Camera* rotation/orientation matches that of the object it is following.

2.4 Viewport

The ***Viewport*** presents a visual display of the currently running scenario or log file.

Most viewport selections such as ROV cameras and sonars are constrained to objects and are not adjustable, except by moving the objects to which they are attached. Exceptions to this include the *Aerial*, *Map* and *NAV* views, which may be adjusted using the mouse.

Viewport/Camera Settings Menu

- The currently selected camera/sonar is displayed in the top-left corner of the Viewport.
  - If these are not visible, hovering the mouse in the top-left corner of the Viewport will make it appear.
- Clicking the current camera/sonar name with the left or right mouse button will display a dropdown with:
  - All available cameras and sonars.
    - The right and left arrow keys on the keyboard may also be used to cycle through available cameras/sonars.
  - Options to **Add** or **Remove** cameras/sonars to the cycle (when using arrow keys or multiple viewports).
    - Added cameras appear after the camera view in which the option was selected.
  - Options to change the configuration of the ***Viewports*** when multiple viewports are activated using the *Screen Settings Menu* in the top-right corner of the ***Viewport*** or by pressing the *F5* key.
    - The configuration of multiple viewports (positions of each viewport) may be modified using the **Use Vertical Split** option. This defines the primary split as being either horizontal (default) or vertical when adding viewports.
    - When multiple viewports are visible, they may be resized using the mouse by dragging the viewport boundaries to the desired positions.
      - Each viewport has a camera/sonar name in the top-left corner, which may be used to select the camera view for that viewport.
    - The user may **Save Settings** for multiple viewports so they load automatically on the next scenario startup.
      - The saved configuration is loaded for any scenario that uses the same combination of vehicles.
      - The user may **Restore Defaults** to revert the Viewport settings to the initial layout, ignoring any modifications.
  - Options to change the **Lighting** in the Aerial View.
    - **Global** lighting is the default selection with the ambient Aerial View lighting activated.
    - **Viewer** lighting is similar to Global lighting, but without the *Global Lighting* or *Global Shadows* enabled.
    - **Scene** lighting uses no ambient lighting at all, and is lit using only the lights defined in the scenario.
  - Options to modify the visual appearance of the **Selection** in the Viewport.
    - **Show Outline** toggles the visibility of the object outline.
    - **Isolate** modifies visibility of objects in the scenario such that the selected object(s) remain completely visible, while all other objects become semi-transparent.
      - This mode remains active, even while changing the selected object(s),

until deactivated from this menu.

- **Isolate Options** opens a dialog with ways to modify the appearance of objects and the environment around the selected object(s).
  - The color selector and the *Use Color* checkbox hides all objects excluding the selected object(s) and changes the background to the selected color.
  - The *Opacity* slider changes the opacity of all objects excluding the selected object(s).
    - Note that this slider is overridden by the color selector (if a color is used, all other objects are hidden).
- **Single Click** toggles behaviour of the Select Tool in the ***Viewport***.
  - When inactive (default), single-clicking on an object does not change the current selection in the ***Viewport***, *Explorer*, or *Properties Panel*. A double-click is required to change selection.
  - When activated, single-clicking on an object changes the current selection in the ***Viewport*** (shows the *object outline*, if enabled), *Explorer*, and *Properties Panel*.
    - Note that a double-click is still required to change the object to which the camera is locked.

- Option to **Show Group Colors**.
  - Switches the visible color of any objects included in a *Group* to the *Group color*.
  - This menu option is only available when there is at least one *Group* included in the scenario with a color assigned.
  - This may also be activated using the *F1* key.
- Options to **Save Aerial View** positions.
  - Clicking *Save Aerial View* will display a dialog to name the saved position and orientation.
  - Note that this does not create an additional *Aerial View* camera, but a defined position to which the Aerial camera may be moved.
  - The saved Aerial View position is then selectable in the **Select Aerial View** list unless it is removed using the **Remove Aerial View** option.
  - The scenario must be saved in order to permanently include the added Aerial Views in the scenario file. Otherwise, they will be available only until the scenario is ended.

Object Selection Menu

- The currently (or most recently) selected object is displayed in the top-left corner of the Viewport next to the camera/sonar selection.
  - If it is not visible, hovering the mouse in the top-left corner of the Viewport will make it appear.
  - This menu is only available in the *Aerial View*.
- Clicking the object name with the left or right mouse button will display a list of selectable objects in the scenario and the option to lock the camera in relation to the selected object.
  - **Lock** constrains the position of the camera to that of the selected object, regardless of orientation.
  - **Follow** constrains both the position and orientation of the camera to that of the selected object.
  - **Auto** constrains the position of the camera to that of the selected object and orientates the camera to the object orientation (similar to *Follow*) but has a list of preset camera angles (**Auto Camera View**) and definable smoothing options to *customize movement of the automatic camera*.
- Below the camera constraint options, there are categories for all the objects in the scenario.

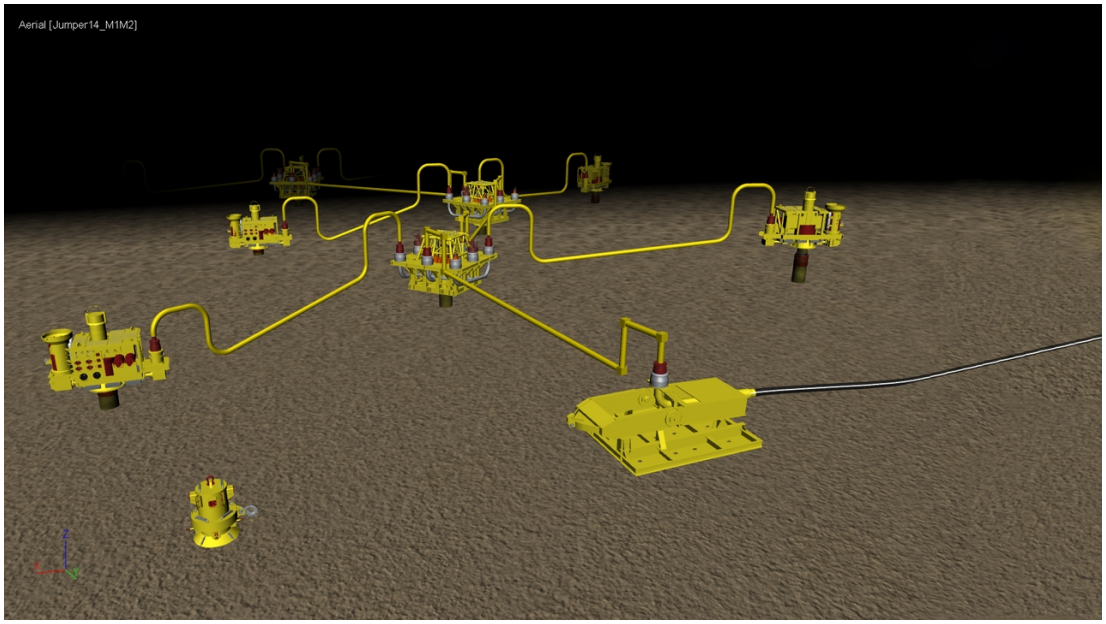
Hovering the mouse over any of the categories will expand to show the objects included in the category.

Screen Settings Menu

- Options to modify the Viewport(s) on the selected screen are displayed in the top-right corner of the Viewport, including:
  - **Add Viewport**
    - The leftmost button adds a viewport to the current screen up to a maximum of 4.
    - The button is displayed differently, depending on the current number of active viewports on the screen and vertical split screen option ( ,  ,  ,  ,  , or ).
      - The button graphic indicates the viewport configuration for the current screen after the button is clicked. For example, if there is currently one viewport visible, the button is displayed as  or  to indicate that clicking the button will split into two views.
      - Each viewport has a camera/sonar name in the top-left corner, which may be used to select the camera view for that viewport.
    - When screens are added, this button is available at the top-right corner of each screen as well.
      - Viewports may also be added using the *F5* key.
      - To add viewports to the second screen using *F5*, that screen must first be activated by clicking on it with the mouse.
      - When 4 viewports are displayed, clicking this button will set the screen back to 1 viewport.
    - When multiple viewports are visible, they may be resized using the mouse by dragging the viewport boundaries to the desired positions.
  - **Fullscreen**
    - The center button hides the currently displayed menus and toolbars, expanding the viewport(s) on the first screen to cover the entire area of the screen
      - This button is only available on the first screen, as each additional screen is always in fullscreen mode.
    - The button is displayed as  when not in fullscreen mode (default) and as  when in fullscreen mode.
    - Fullscreen mode may also be activated/deactivated using the *Enter* key.
  - **Add Screen**
    - Adds a viewport on the next available screen/display.
      - When additional screens are activated on all available displays, clicking this button will deactivate the additional displays.
      - This button is only available when multiple displays are connected.
      - Additional screens may also be added/removed using the *F9* key.
    - The button is displayed as  .

2.4.1 Aerial View

The ***Aerial View*** is the default camera displayed in the *Viewport*.



It is an adjustable camera that may be freely movable, or centered on an object. Double-clicking on any object in the scenario (excluding the terrain and ocean surface, as well as any tether, umbilical, or cable) makes that object the center of focus/rotation.

The position and orientation of the *Aerial View* can be modified using the mouse:

- Holding down the left mouse button while moving the mouse will change the orientation of the camera.
- Holding down the right mouse button while moving the mouse will zoom in or out in the current view.
  - Using the mouse scroll wheel will also zoom in and out.
- Holding down the middle mouse button (scroll wheel) while moving the mouse will change the position of (or pan) the camera.
  - If the user pans the camera, it becomes freely movable, and is no longer locked to any object.

2.4.2 Map / NAV Views

The ***Map View*** and ***NAV View*** are orthographic top-down camera views of the running scenario/log file.

These views are freely movable using the mouse. The position of the ***Map View*** or ***NAV View*** can be modified using the mouse:

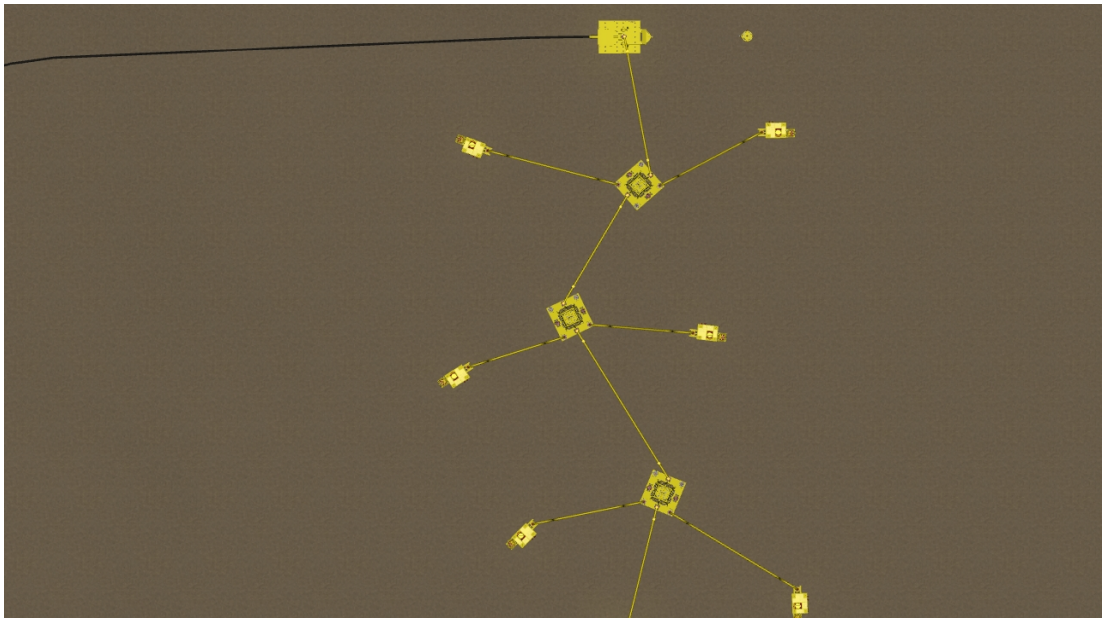
- Holding down the left mouse button while moving the mouse will change the position of (or pan) the camera.
- Using the mouse scroll wheel will zoom in or out in the current view.

Clicking the right mouse button will display an option to switch to the *Aerial View*, which will be located at the position in the scenario where the mouse is clicked.

The *Map* view is not included by default in the camera cycle (using arrow keys or multiple viewports), but may be added by clicking the name of the current camera in the top-left corner of the viewport and choosing *Add* > *Map* from the menu. It will appear after the camera view in which the option was selected.

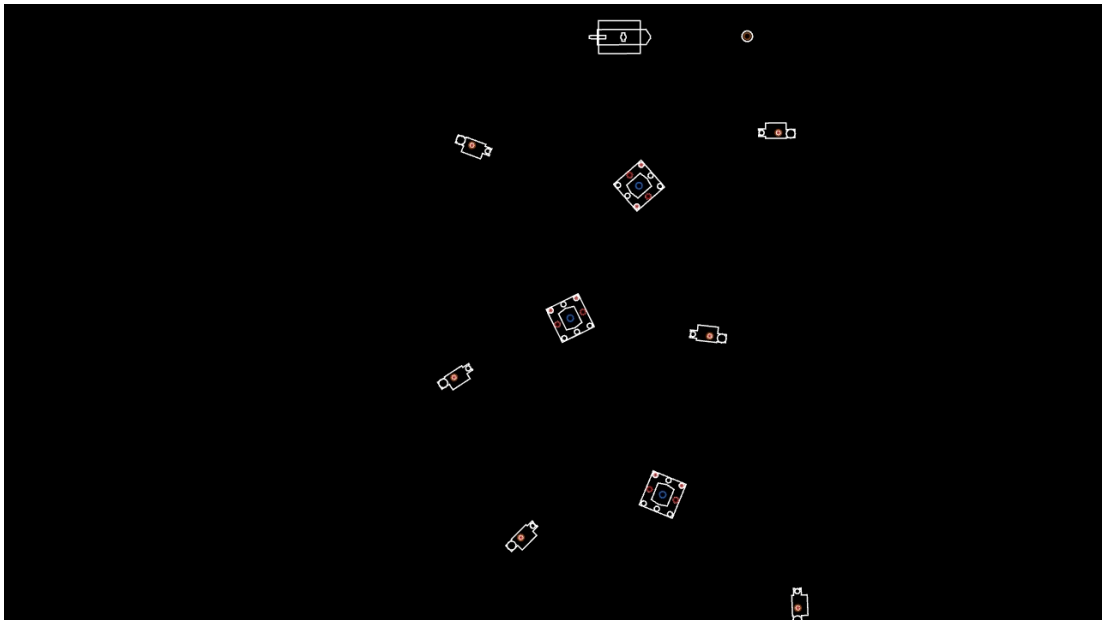
Map View

- Has ambient lighting, and is not affected by scene (ROV) lights.
- Displays all objects, terrain, tethers, umbilicals, cable, etc.
  - Does not display ocean surface.
- Double-clicking on any object in the scenario (excluding the terrain, as well as any tether, umbilical, or cable) temporarily makes that object the center of focus.
  - The center of the screen stays in the selected object's position (does not follow the object if moved).



NAV View

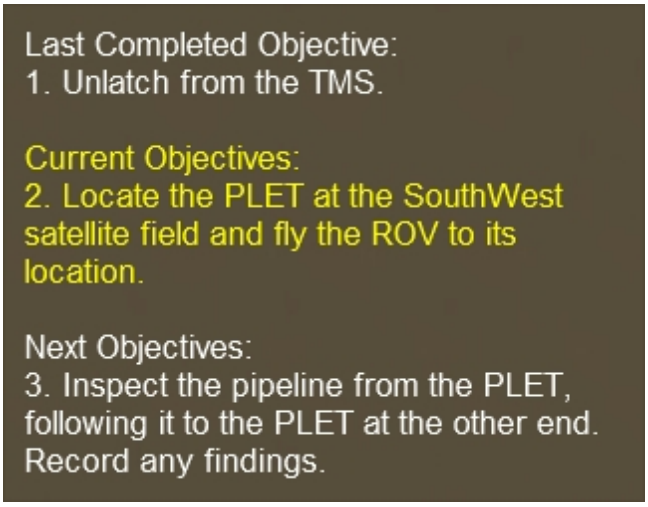
- Displays all objects' associated DWFs as opposed to the simulated objects/models.
  - Does not display ocean surface or terrain.



2.4.3 Objective Overlay

The ***Objective Overlay*** is a tool that helps guide and evaluate independent learning. It is a central application of the VROV system that describes mission instructions and completion status as the user progresses through a mission. This progressive instruction ensures that training points are completed in a specific order, allowing students to self-monitor training, without the need for constant supervision.

It is displayed during training in the top-right corner of the screen, with options to display the *Last Completed*, *Current*, and *Next* objectives or to display only the *Current* objective. It is only available in *Editor*, *Simulator*, and *Player* modes.



After all objectives have been completed, the ***Objective Overlay*** displays a *Mission Complete* message. The user may then Save *Summary Report* in the *ICC Command Dialog*, which displays:

- Scenario information (Time, Date, Pilot ID, Environmental Conditions)
- Objective List
- Completion Verification with Time Stamps
- Level of Difficulty

- Pilot and Supervisor Verification

Summary Reports are saved in secure PDF format and cannot be altered by the student. They can be reviewed and compared against other pilots to compare strengths/weaknesses, and the best pilot for a particular mission.

2.5 Status Bar

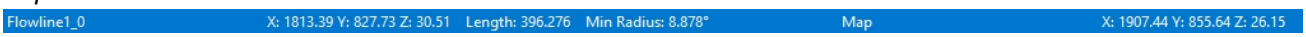
The ***Status Bar*** displays information about the status of the currently selected element, including its name, position and orientation. It also displays the currently selected camera view and the camera's current position in 3D space. It may be enabled from the *View Menu*

If the selected view is the *Map view*, instead of camera position, the position displayed is the Easting and Northing (X and Y) coordinates of the mouse pointer, and the height or depth (Z) of the terrain at that location.

If the selected object is a line, the ***Status Bar*** will display the line's length and minimum bending radius. When in *Map view*, the ***Status Bar*** will show the Easting and Northing (X and Y) coordinates of the mouse pointer, and the height or depth (Z) of the terrain at that location.

Aerial View with *Object* selected:

Map View with *Line* selected:



3 How to / Tutorials

The following item detail the steps involved in the most common uses for the iDEA-DT:

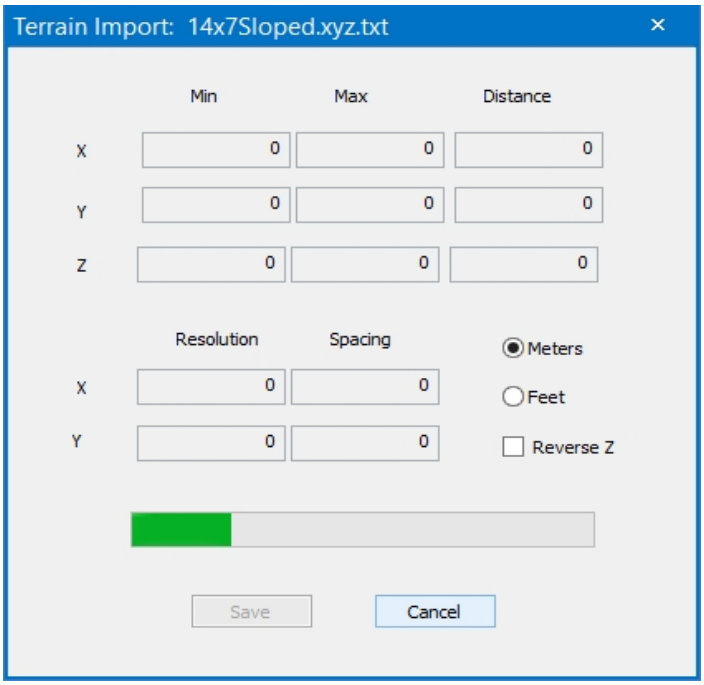
1. ***Import a Terrain***
2. ***Create / Edit a Scenario***
3. ***Create / Edit a Line***
4. ***Create / Edit a Jumper***
5. ***Create / Edit a Group***
6. ***Working with GIS Data***

3.1 Import a Terrain

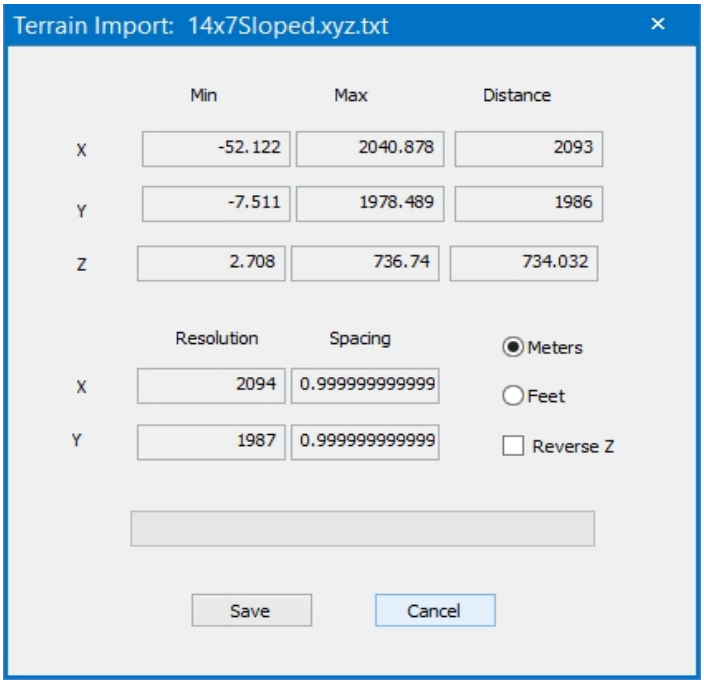
Terrain files (*XYZ* or *TXT* format) may be imported and converted to GRi's proprietary terrain format. The terrain may then be used .

Import a Terrain

1. Open the **iDEA-DT** software
2. Select **File > Import Terrain** from the *MenuBar.*
3. Browse to the directory containing the terrain file (*XYZ* or *TXT* format). Select the file and click **Open**. After the terrain file is selected for import, the user will see the *Terrain Import Progress* dialog.



4. When the data import is complete, the user will see some basic details and can select the units of measurement for the imported data (as shown below). Selecting **Save** will allow the user to name and save the newly imported terrain.



5. When complete, the new terrain will be included in the list of available terrain files in the *Terrain Selection dialog*.

3.2 Create / Edit a Scenario

Scenarios may be created and/or edited using the iDEA-DT in *Editor* mode.

Create a New Scenario

1. Open the **iDEA-DT** software.
2. Select **File > New** from the *MenuBar* to open the *Select Terrain* dialog.
3. Choose an existing terrain from the dropdown and click **OK** to start a new scenario with the selected terrain in *Editor* mode.
4. Objects can be added to the scenario from the *Asset Library*. From the library, either double-click the desired object or drag it from the library into the *Viewport*
5. When the scenario is complete, save it by selecting **File > Save Scenario** or **File > Save Scenario As.**
    - Please see notes on *scenario names*.
    - Note that it is recommended to always use a different name from any of the existing content so there is no confusion between that and any custom content.
6. To start dynamic simulation, select **Mode > Simulator** from the *MenuBar*.

Edit an Existing Scenario

1. Open the **iDEA-DT** software.
2. Select **File > Open Scenario** from the *MenuBar* to open the *Select Scenario* dialog.
3. Choose a scenario from the dropdown and click **OK** to start the scenario in *Editor* mode.
4. To modify the scenario, select **Mode > Editor** from the *MenuBar*, then use the *Tool Ribbon* and/or *Asset Library* to edit the scenario.
    - Save modifications by selecting **File > Save Scenario As.**
        - Please see notes on *scenario names*.
        - Note that it is recommended to always use a different name from any of the existing content so there is no confusion between existing and custom content.
5. To start dynamic simulation, select **Mode > Simulator** from the *MenuBar*.

Copy Scenario(s) to VROV Simulator (if applicable)

1. Open the **iDEA-DT** software.
2. Select **Simulator > Update** from the *MenuBar*.

General notes on scenario names:

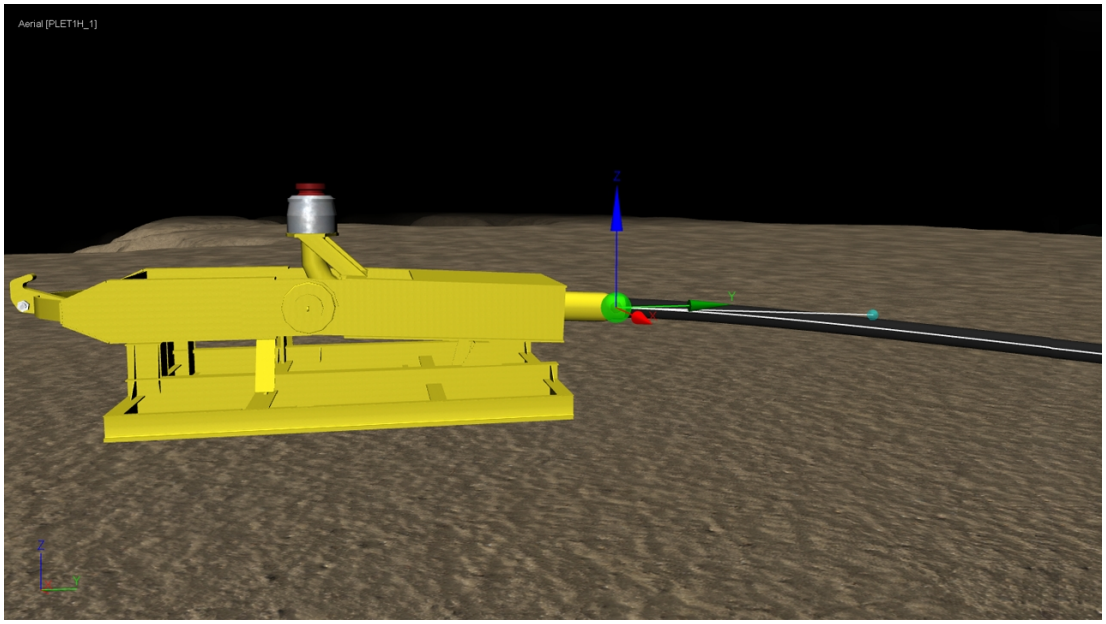
- Scenarios are typically named with the syntax *ScenarioName_VehicleName*.
    - This formatting automatically fills the ICC Controls scenario selection dialog, where the *VehicleName* parameter becomes an option in the *Vehicle* dropdown and the *ScenarioName* fills the *Scenario* dropdown.
        - The *ScenarioName* may include spaces if desired, but underscores (_) will cause it to separate into the fields of the ICC Controls scenario selection dialog.
        - This is not applicable when loading scenarios from the *File menu* in the iDEA-DT since the full name of the scenario is displayed.

3.3 Create / Edit a Line

Lines may be created and/or edited using the *Line Tool* in iDEA-DT in *Editor* mode.These are used as representations of pipelines, flow lines, umbilicals, flying leads, flexible risers, etc. in the scenario.

Create a New Line

- Lines may be created in the *Map View* (preferred) or in the *Aerial* camera.
    1. Open the **iDEA-DT** software and start scenario (or create a new scenario) in *Editor* mode.
    2. Determine the view (Map or Aerial) and location in the *Viewport* where the new line will be created.
    3. Select the *Line Tool* ( ) in the *Tool Ribbon*.
    4. In the *Properties Panel*, which will automatically open when the *Line Tool* is selected (if not previously visible), choose the **Line Type** from the dropdown.
        - The properties of the *Line Type* are displayed in the *Properties Panel* upon selection.
    5. Begin creating the line in the *Viewport* by left-clicking on the terrain.
        - A point is created on the terrain for each clicked position.
        - As the line is created the user can remove the last point drawn using *Ctrl+Z* on the keyboard.
        - The camera may be moved as well as zoomed in/out using the *camera keyboard controls* or *Viewport* mouse controls while the line is being created.
    6. When the last point for the line is created, right-click to end the line and show a dialog box where a name for the line may be entered.
    7. Once a line has been created, its end points can be connected to pre-defined line connection points (*Snap Points*) on some equipment models. The line's end-point connectors are defined with red spheres.
        - The user can manipulate these end connectors by clicking them with the mouse pointer and dragging them to an available connection point. All possible connection points in the scenario are highlighted with green spheres when a line's end-point connectors are selected. The curve of the end connection can be adjusted using the yellow spheres on the two Bezier *handles*. The user can hold *shift* while using the Bezier *handles* to adjust each side of the curve independently.



Edit a Line

- Lines may be edited using the *Move Tool*. With this tool activated, the user may select and unlock any line in the scenario, then select a point on the line and move it using the translate gizmo. Alternatively, click-dragging the point itself will move it horizontally (not in the Z-axis). Using this method sometimes results in some points positioned undesirably below or above the terrain. All points on a line can be snapped back to the level of the terrain by right-clicking the line name in the *Scenario Explorer* and selecting *Use Terrain Z*. This function does not affect the end connection curves.
- New points may be added to a line by double-clicking anywhere on the line.
  - A point may also be removed by selecting it and pressing the *Delete* key.

3.4 Create / Edit a Jumper

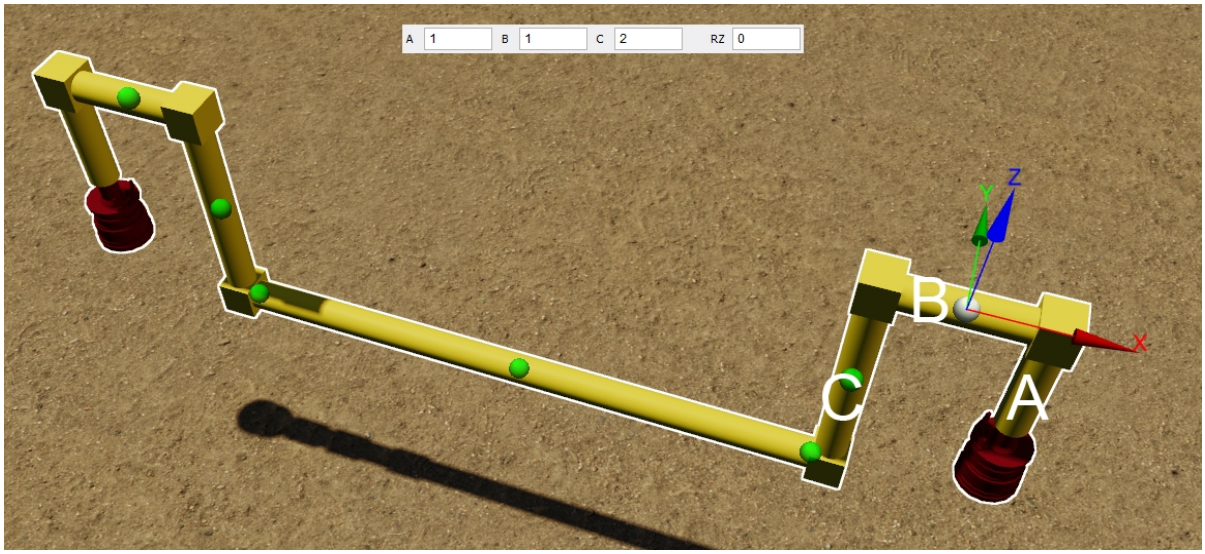
Jumpers may be created and/or edited using the iDEA-DT in Editor mode.

Create a New Jumper

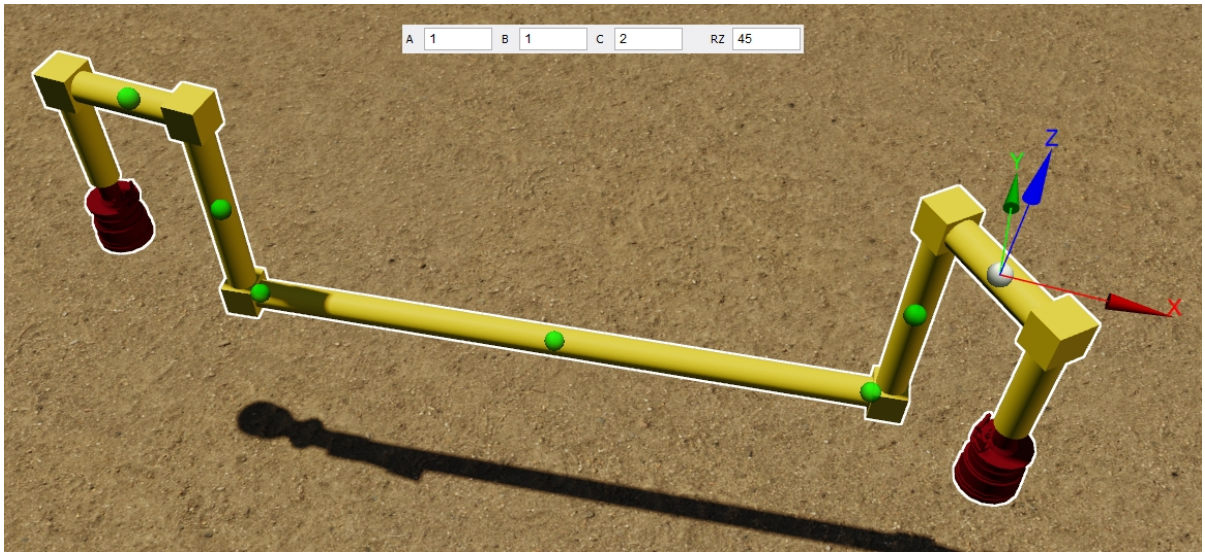
1. Open the **iDEA-DT** software and start scenario (or create a new scenario) in *Editor* mode.
2. From the *Asset Library*, double-click a jumper type or click and drag it into the scenario.
3. To move the Jumper, activate the *Move Tool* and click-and-drag one of the end connections to move that end of the *Jumper* in the *Viewport*. Note any predefined destinations (*Snap Points*) while moving the *Jumper* connector. To reposition the entire jumper without connecting to a *Snap Point*, either use the *Move Tool* gizmo or click any place on the jumper that is not a an end connector or spherical object and it may be dragged around the *Viewport* with the mouse.

Customizing a Jumper

1. *Jumpers* may be edited using the predefined green spheres that appear along the *Jumper* sections when selected. The green spheres are used to resize/reshape the jumper along its X,Y, and Z axes. Selecting the end connection points of the *Jumper* will allow the user to resize the object and move it around in the *Viewport*.
    1. Selecting the center sphere on the *Jumper* displays that sphere position in the world in the *Tool Ribbon entry boxes*. This sphere may only be moved in the Z-axis using the *Move Tool*., as its X and Y coordinates are determined by the shape of the remaining segments of the *Jumper*
    2. Selecting any of the three spheres near either end of the *Jumper* (not the sphere at the very center) changes the *Tool Ribbon entry boxes* to display dimensions of the straight sections of the Jumper pipe in meters.
        - Default lengths upon creation of a new Jumper are 1, 1, 2.



- The rotation of each jumper end connection may also be edited from the *Tool Ribbon entry boxes* using the RZ box. This value does not change the values of the segments labelled A, B, or C, but will automatically update the central segment as required.



Clicking anywhere on the jumper that is not a spherical object while the *Move Tool* is active will allow the user to reposition the entire object.

3.5 Create / Edit a Group

Groups provide the user with a way to isolate and visualize specific sets of objects. Groups are managed in the *Explorer*.

Create a New Group

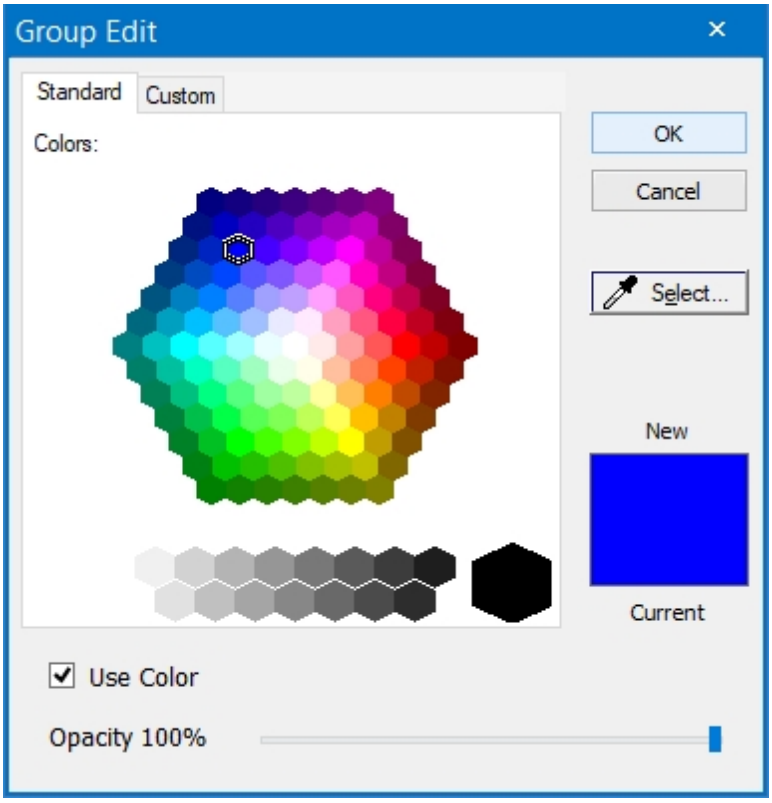
- Groups may be created using two different methods:
  1. Create a new empty *Group* in the *Explorer* directly:
     1) Open a scenario in *Editor* mode in the **iDEA-DT**.
     2) Right-click in the empty space below all the element headers in the *Scenario Explorer* and choose the **Add Group** option.
  2. Create a *Group* beginning with one of the objects to be included in the *Group*:
     1) Open a scenario in *Editor* mode in the **iDEA-DT**.
     2) Expand an object header (ex: **Static Objects** or **Moveable Objects**) in the *Scenario Explorer*.
     3) Right-click an object, and choose **Group > Add**.
  - Either of these methods will open the **Select Group Name** dialog. After entering a name for the *Group*, a **Groups** header will appear in the *Scenario Explorer* (if not previously existing), which may be expanded to see all *Groups* in the scenario.
  - Note that sub-groups may be created by right-clicking on a *Group* name and choosing **Group > Add Group**.

Add Objects to a Group

- Objects may be added to a *Group* (or sub-group) using any of the following methods:
  1. Use the second method of creating a *Group*, as defined above, and the object will automatically be included in the created *Group*.
  2. From the object's right-click menu in the *Explorer*
     1) Expand the object header (ex: **Static Objects** or **Moveable Objects**) in the *Scenario Explorer* containing the object to be added to a *Group*.
     2) Right-click the object and highlight **Group** to expand the sub-menu:
        - Below the option to **Add** a new *Group* and the menu divider, there is a list of all existing *Groups* in the scenario.
        - By default, objects are not included in a *Group*, so the *Group* designation is **None**.
     3) Select one of the *Group* names to add the object to a *Group*.
     - Note that this same procedure may be followed for objects already included in a Group to move the object to a different *Group* (or remove from all groups by right-clicking selecting **Group > None**).
- Once a *Group* contains at least one object, the *Group* may be expanded to see all objects contained within the *Group*, as well as any sub-groups.

Change the Properties of a Group

- The visual properties of a *Group* may be modified from the *Scenario Explorer*:
  1. Expand the **Groups** header in the *Scenario Explorer* to see all *Groups* in the scenario.
  2. Right-click a *Group* name and select **Color** to display the **Group Edit** dialog.
     - In the Group Edit dialog, there are three properties available to modify:



1. **Colors** selector
   - Defaults to white.
   - A new color may be selected by clicking any of the swatches in the **Standard** tab, by choosing the Select dropper and choosing any color on the screen, or by clicking the **Custom** tab to input exact color values.
2. **Use Color** checkbox
   - Defaults to inactive (deselected).
   - Activating this checkbox will change the color of all objects in the selected *Group* to the defined color
     - Note that this display may be activated/deactivated from the *Viewport/Camera Settings Menu* or by pressing the *F1* key.
     - Selecting a new color (other than the default white) will also automatically activate this checkbox.
3. **Opacity** slider
   - Defaults to 100%.
   - Changes the opacity/transparency of all objects in the *Group*.

- Note that sub-groups do not inherit the visual properties of the parent *Group*, and must be defined individually for each sub-group.

Remove Objects from a Group

- Objects maybe be removed from a *Group* (or sub-group) using any of the following methods in the *Scenario Explorer*:
  1. Delete the *Group* (see instructions below).
  2. In the expanded *Group*, select the object and press the *Delete* key.
  3. In the expanded *Group*, right-click the object and highlight **Group** to expand the sub-menu.

Then select **None** to remove the object from all *Groups* (or select one of the other *Group* names to move the object to that *Group*).

4. In the expanded *Group*, select the object and drag it into a different group.
5. Expand the object header (ex: **Static Objects** or **Moveable Objects**), right-click the object and highlight **Group** to expand the sub-menu. Then select **None** to remove the object from all *Groups* (or select one of the other *Group* names to move the object to that *Group*).

Delete a Group

- After a *Group* is added to a scenario, it may be removed using the following steps:
  1. Open a scenario in *Editor* in the **iDEA-DT** that contains at least one *Group*.
  2. Expand the **Groups** header to see all *Groups* in the scenario.
  3. Select one of the *Groups* and press the **Delete** key on the keyboard.
     - Note that deleting a *Group* does not delete any objects from the scenario. It just removes any assigned *Group* designations for the object(s).

3.6 Working with GIS Data

Some of the more advanced features of the iDEA-DT software are its ability to import, visualize, manipulate and export ***GIS*** data. Currently, the iDEA-DT software only accepts ESRI's format of GIS shapefiles and geodatabases.

GIS Data Preparation

- Prior to import into iDEA-DT, GIS data should be made ready for 3D editing by ensuring any shape layers from the geodatabase to be edited in 3D are setup to contain 3D data. A geodatabase can contain both 2D and 3D layers, but only the 3D layers will retain any edits done in the iDEA-DT when exported.
- ESRI Geodatabase shape layers can be converted from 2D to 3D, setting all features to sea level (or Z=0), in ESRI's Arc Catalogue software using the steps below:
    1. Start Arc Catalogue, navigate to the geodatabase folder and open the geodatabase to see the shape layers.
    2. Right-click on the layer you want to convert and select **Export > To Geodatabase (single)**. This will open the Feature Class to Feature Class dialog box.
    3. In the Output Location field, navigate to the same geodatabase you are editing.
    4. In the Output Feature Class field, enter the name of the new 3D layer you want to create. We recommend using the same name as the layer you are converting and adding "***_3D***" at the end to differentiate it from the 2D version of the layer. (i.e., ***FAC_GRI_MFLD*** => ***FAC_GRI_MFLD_3D***)
    5. Select the **Environments** button at the bottom of the dialog box. This will open the Environment Settings dialog box.
    6. Expand the **Z Values** section of the list, enter ***0*** in the **Default Output Z Value** field and select ***Enabled*** from the **Output has Z values** drop-down menu. Click OK
    7. Click OK again to run the conversion. This will create a new 3D layer in the geodatabase.
    8. The old 2D layer can now be deleted, leaving only the new 3D layer.
    9. Repeat this process for any other layers that need to be edited in 3D in iDEA-DT.
- Note: The method above shows how to convert a shape layer to 3D using a constant. Geodatabase shape layers can also be converted to 3D using a surface (bathymetry file) or an attribute of the feature, but these additional data types may not always be available. See ESRI's online documentation for instructions on how to use these other conversion methods.

GIS Data Import

- Users can import GIS geodatabases into iDEA-DT using the following steps:
    1. Open the iDEA-DT software, select **File > Open Geodatabase**, navigate to the location of the geodatabase folder, select it and click **Select Folder**.
    2. In the Geodatabase Import dialog box, select the units that the geodatabase uses.
    3. There are options to snap all of the data to either the ocean surface (***Use Surface Z***) or the seafloor (***Use Terrain Z***). Select one of these checkboxes if desired. In most cases for subsea projects, the user will select ***Use Terrain Z*** when importing a geodatabase for the first time. This will bring all of the data down to terrain level, where most of the equipment is located.
    4. Click **OK** in the Geodatabase Import dialog. This will open the Select Terrain dialog box.
    5. Select the desired terrain from the drop-down menu and click **OK**. (Users can import XYZ bathymetry files to create 3D terrains from the File menu – see section 2.2.1)
    6. The GIS data and terrain file will load into the 3D viewport. Any 3D models that have been setup to work with the GIS data will be imported and positioned accordingly. Any 3D line shapes that have been setup to work with the GIS data will be automatically created. (GRi's 3D Models can be linked to GIS data by including the model's name in a "Tag_3D"

field for that feature in the attribute table of the shape layer.)

Manipulating GIS Data in iDEA-DT

- Once the geodatabase has been imported into iDEA-DT the user can edit the position of any linked 3D models or lines using the Move Tool. The edits to the 3D models and 3D line shapes will be reflected in the linked GIS data.
- Users can follow the general workflow detailed below to edit their data in iDEA-DT:
    1. Hide any geodatabase layers that don't need to be edited. This will clean up the scenario so only the required working data is visible. This can be done by expanding the geodatabase in the Geodatabases section of the Scenario Explorer and unchecking the boxes for any layers the user wants to hide.
    2. Move any 3D models for support structures, such as wellheads and suction piles, to their correct depths or stick-up heights.
    3. Move any 3D models for equipment with mud-mats (equipment that sits directly on the terrain) to the desired depths.
    4. Snap 3D models of any equipment that sits on support structures onto the 3D models of the support structures.
    5. Move any surface objects, such as floating platforms and support vessels, up to the ocean surface.
    6. Complete the end-point connections of any 3D lines that need to be connected to equipment models.

GIS Data Export

- Once the geodatabase has been edited to the user's satisfaction, it can be exported back out of iDEA-DT for use in other applications. Follow the steps below to export a geodatabase from iDEA-DT:
    1. Right-click the geodatabase in the Scenario Explorer panel and select **Export**. This will open the Select GDB Folder dialog.
    2. Use the button to the right of the text box to open the Select Destination Folder dialog.
    3. Click the New Folder button at the top, and name the new folder accordingly.
    4. Click Select Folder, and then click OK to export the geodatabase to that location.
    5. The exported geodatabase can now be loaded into ArcGIS applications, and other GIS software packages that accept ESRI format GIS data.

4 Keyboard Commands

Below are keyboard commands for controls in the *iDEA-DT*:

Keyboard Command	Description
F1	Activate / Deactivate Group colors display.
F3	Toggles *Aerial* camera lock/unlock function.
F5	Cycles multiple camera views.
F6	Toggles *Aerial* camera global lighting vs scenario lighting.
F7	Toggles *AutoLights* on/off.
F9	Activates / Deactivates additional view(s) on a second monitor.
Ctrl + C	Activates / Deactivates compass.
Enter	Toggles Fullscreen on/off.
← → (Arrows)	Cycles display of available cameras/sonars.
W, A, S, D	Move the *Aerial*, *Map*, or *NAV* cameras forward, left, back, and right (Holding *Shift* with any of these keys will enable the "Run" camera movement. speed setting - View > *Aerial* Camera Settings).
Q, E	Move the *Aerial*, *Map*, or *NAV* cameras up and down (Holding Shift with any of these keys will enable the "Run" camera movement speed setting - View > *Aerial* Camera Settings).

When ICC Controls are Visible (in Simulation Mode)

Keyboard Command	Description
Ctrl+F	Begins, Pauses, or Resumes a *scenario/log file* physics/playback.
Ctrl+G	Stops the current *scenario/log file.*
Ctrl+H	Begins or ends recording of a *log file/video.* Note that a Profile must be loaded.

When Joysticks are Connected and Assigned (in Simulation Mode)

Keyboard Command	Description
Ctrl + J	Displays / Hides joystick designations (if applicable).
1	Cycles through items controllable by Joystick 1 (if applicable).
2	Cycles through items controllable by Joystick 2 (if applicable).

5 Troubleshooting

If you have questions about a topic that is not covered in this document, please visit our ***web support*** for assistance.

Common Errors

If a scenario does not start, or does not perform as expected, it is important to know how to go about debugging it. Typically, the most useful information is found in the *debug.txt* file located in the root of the VROV module folder, typically **C:\iDEA-DT_*(folderName)*\debug.txt** . Below is a list of the most common issues:

1. iDEA-DT doesn't start from the desktop icon.
    - Possible Sources of Error:
        - Software License.
            - If using a physical Hasp dongle for licensing, check that hasp light is on. If not, try reinstalling the drivers.
            - If using a software lock for licensing, the license may be expired.
        - Check for an instance of the module already running. Only one instance may be running at a time.
        - Check that the GPU is not overloaded. For example, connecting four monitors at 2160 resolution will cause the VROV software not to run due to strain on the GPU.