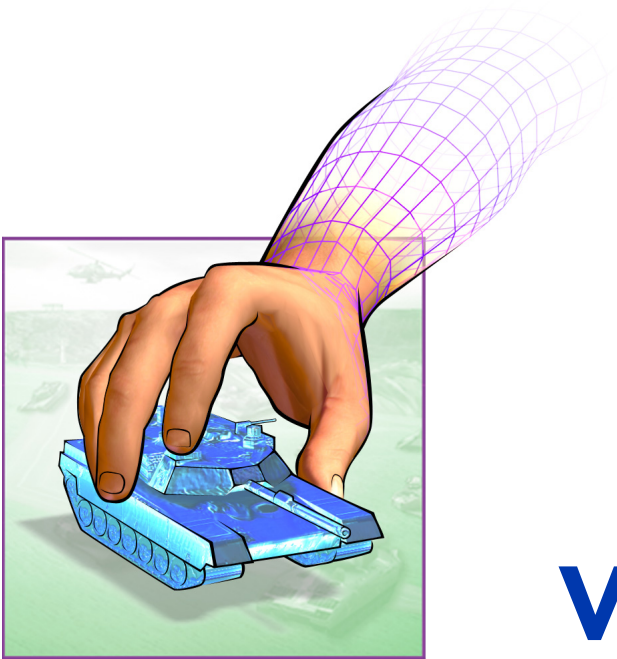
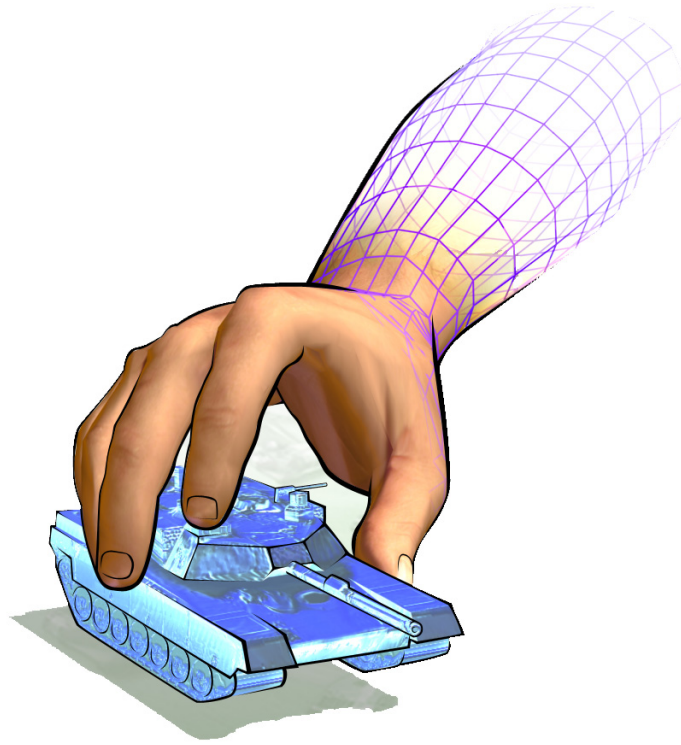




VR-Forces

Scenario Management Guide



VR-Forces

Scenario Management Guide

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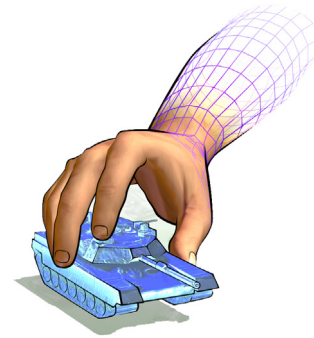
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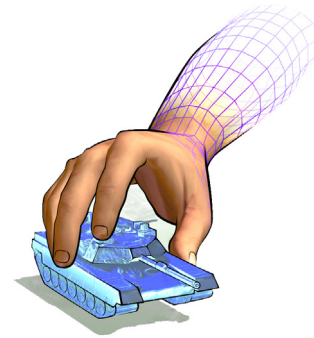
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Preface

This manual is written for persons who will use the VR-Forces application. The manual assumes that you are familiar with your operating system and that you know how to work in your computer's graphical window environment.

Please see release documentation for information about changes and updates to VR-Forces since this manual went to press.

How This Manual is Organized

The chapters are organized as follows:

Chapter 1, *Creating and Running Scenarios*, explains how to create and run scenarios, how to create batch scenarios and how to checkpoint scenarios.

Chapter 2, *Creating and Placing Objects*, explains describes the common procedures for creating entities, tactical graphics, and props.

Chapter 3, *Creating and Managing Entities*, explains how to create and manipulate entities.

Chapter 4, *Working with Aggregate Entities*, explains how to create and manipulate aggregate entities.

Chapter 5, *Overlays and Tactical Graphics* describes the creation and use of overlays and tactical graphics.

Chapter 6, *Assigning Tasks*, explains how to assign tasks to entities.

Chapter 7, *Issuing Set Data Requests*, describes how to assign set data requests to entities.

Chapter 8, *Writing Plans* explains how to write plans for entities and how to write global plans.

Chapter 9, *Target Detection and Combat Features*, describes spot reports, laser targeting, entity hostility, and how entities take damage.

Chapter 10, *Environment Settings*, describes explains how to manipulate the time of day and weather conditions.

Appendix A, *Example Scenarios* walks you through the process of creating two of the sample scenarios provided with VR-Forces.

VR-Forces Documentation

VR-Forces documentation is provided as manuals in PDF format, online help, and HTML class documentation. The PDF files are in the *.doc* directory. The VR-Forces documentation set is as follows:

- *VR-Forces Getting Started Guide* is a quick introduction to VR-Forces. It covers the basics of installing VR-Forces, running a scenario, and creating a scenario. It focuses on helping new users avoid common mistakes.
- *VR-Forces Documentation Center* is your central starting point for accessing the VR-Forces manual set. It has a documentation roadmap, tables of contents for all manuals, and a master index, including the TDB Tool, to help you find references to subjects that are covered in two or more manuals or locate the manual in which a particular topic is discussed. All table of contents entries and index entries are live links to the manuals.
- *VR-Forces Users Guide* describes how to install VR-Forces and configure license management. It explains how to use the VR-Forces graphical user interface to view simulations and how to manage aspects of VR-Forces that are not directly related to creating and running scenarios.
- *VR-Forces Scenario Management Guide* explains how to create and run scenarios.
- *VR-Forces Configuration Guide* explains advanced features for configuring performance and how to edit VR-Forces configuration files. It includes documentation of the Entity Editor, OPD Editor, and Scenario Merge tools.
- *VR-Forces Developers Guide* explains how to use the VR-Forces simulation and remote control APIs. It focuses primarily on the simulation engine.
- *VR-Forces Front-End Developers Guide* explains how to extend or modify the VR-Forces graphical user interface (GUI).
- *VR-Forces Migration Guide* collates API migration information for each release in the VR-Forces 3.x series.
- Online help. The VR-Forces front-end, the OPD Editor, the Entity Editor, and the TDB Tool have online help accessible from the Help menu.
- Class documentation. Classes are documented in linked HTML pages.
- *VR-Forces Release Notes*.

MÄK Products

VR-Forces is a member of the VT MÄK line of software products designed to streamline the process of developing and using networked simulated environments. The VT MÄK product line includes the following:

- ♦ **VR-Link® Network Toolkit.** VR-Link is an object-oriented library of C++ functions and definitions that implement the High Level Architecture (HLA) and the Distributed Interactive Simulation (DIS) protocol. VR-Link has built-in support for the RPR FOM and allows you to map to other FOMs. This library minimizes the time and effort required to build and maintain new HLA or DIS-compliant applications, and to integrate such compliance into existing applications.

VR-Link includes a set of sample debugging applications and their source code. The source code serves as an example of how to use the VR-Link Toolkit to write applications. The executables provide valuable debugging services such as generating a predictable stream of HLA or DIS messages, and displaying the contents of messages transmitted on the network.

- ♦ **MÄK RTI.** An RTI (Run-Time Infrastructure) is required to run applications using the High Level Architecture (HLA). The MÄK RTI is optimized for high performance. It has an API, RTIspy®, that allows you to extend the RTI using plug-in modules. It also has a graphical user interface (the RTI Assistant) that helps users with configuration tasks and managing federates and federations.
- ♦ **VR-Forces®.** VR-Forces is a computer generated forces application and toolkit. It provides an application with a GUI, that gives you a 2D and 3D views of a simulated environment.

You can create and view local entities, aggregate them into hierarchical units, assign tasks, set state parameters, and create plans that have tasks, set statements, and conditional statements. VR-Forces also functions as a plan view display for viewing remote entities taking part in an exercise. Using the toolkit, you can extend the VR-Forces application or create your own application for use with another user interface.

- ♦ **VR-Vantage™.** VR-Vantage is a line of products designed to meet your simulation visualization needs. It includes three end-user applications — VR-Vantage Stealth, VR-Vantage XR, and VR-Vantage IG — and the VR-Vantage Toolkit. VR-Vantage Stealth displays a realistic, 3D view of your virtual world. You can view this world from the inside of a simulated moving vehicle, or place the eyepoint at another moving or stationary location. The Stealth lets you switch rapidly among several predefined viewpoints while the simulation is underway.

VR-Vantage IG is a configurable desktop image generator (IG) for out the window (OTW) scenes and remote camera views. It has most of the features of the Stealth, but is optimized for its IG function.

VR-Vantage XR provides a common operational picture using the same 3D views as VR-Vantage Stealth, a 2D plan view, and an exaggerated reality (XR) view. Together these views provide both situational awareness and the big picture of the simulated world.

The VR-Vantage Toolkit is a 3D visual application development toolkit. Use it to customize or extend MÄK's VR-Vantage applications, or to integrate VR-Vantage capabilities into your custom applications. VR-Vantage is built on top of Open-SceneGraph (OSG). The toolkit includes the OSG version used to build VR-Vantage.

- **MÄK Data Logger.** The Data Logger, also called the Logger, can record HLA and DIS exercises and play them back for after-action review. You can play a recorded file at speeds above or below normal and can quickly jump to areas of interest. The Logger has a GUI and a text interface. The Logger API allows you to extend the Logger using plug-in modules or embed the Logger into your own application. The Logger editing features let you merge, trim, and offset Logger recordings.
- **MÄK Plan View Display.** The Plan View Display (PVD) provides a 2D, “big picture” of a virtual environment. It shows simulated entities, such as vehicles, soldiers, and tanks moving over a 2D-map display.
- **VR-Exchange™.** VR-Exchange allows simulations that use incompatible communications protocols to interoperate. For example, within the HLA world, using VR-Exchange, federations using the HLA RPR FOM 1.0 can interoperate with simulations using RPR FOM 2.0, or federations using different RTIs can interoperate. VR-Exchange supports HLA, TENA, and DIS translation.
- **VR-TheWorld™ Server.** VR-TheWorld Server is a simple, yet powerful, web-based streaming terrain server, developed in conjunction with Pelican Mapping. Delivered with a global base map, you can also easily populate it with your own custom source data through a web-based interface. The server can be deployed on private, classified networks to provide streaming terrain data to a variety of simulation and visualization applications behind your firewall.

How to Contact Us

For VR-Forces technical support, information about upgrades, and information about other MÄK products, you can contact us in the following ways:

Telephone

Call or fax us at:	Voice:	617-876-8085 (extension 3 for support)
	Fax:	617-876-9208

E-mail

Sales and upgrade information:	info@mak.com
Technical support:	support@mak.com
VR-Vantage support:	vrv-support@mak.com

Internet

MÄK web site home page:	www.mak.com
License key requests:	www.mak.com/support/licenses.php
Product version and platform information:	www.mak.com/support/productversions.php
For the free, unlicensed MÄK RTI:	www.mak.com/products/rti.php
Support FAQ:	www.mak.com/support/faq.php

Post

Send postal correspondence to:	VT MÄK 68 Moulton St. Cambridge, MA, USA 02138
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When requesting support, please tell us the product you are using, the version, and the platform on which you are running.

Document Conventions

This manual uses the following typographic conventions:

Monospaced	Indicates commands or values you enter.
Monospaced Bold	Indicates a key on the keyboard.
<i>Monospaced Italic</i>	Indicates command variables that you replace with appropriate values.
{ }	Indicates required arguments.
[]	Indicates optional arguments.
	Separates options in a command where only one option may be chosen at a time.
()	In command syntax, indicates equivalent alternatives for a command-line option, for example, (-h --help).
/	Indicates a directory. Since MÄK products run on both UNIX and Windows PC platforms, we use the / (slash) for generic discussions of pathnames. If you are running on a PC, substitute a \ (backslash) when you type pathnames.
<i>Italic</i>	Indicates a file name, pathname, or a class name.
sans Serif	Indicates a parameter or argument.
➤	Indicates a one-step procedure.
Menu → Option	Indicates a menu choice. For example, an instruction to select the Save option from the File menu appears as: Choose File → Save .
i	Indicates supplemental or clarifying information.
!	Indicates additional information that you must observe to ensure the success of a procedure or other task.

Directory names are preceded with dot and slash characters that show their position with respect to the VR-Forces home directory. For example, the directory *vrforces/doc* appears in the text as *./doc*.

Hardware and Operating System Naming Conventions

Unless otherwise specified, references to UNIX include Linux, regardless of the type of computer it is running on. References to PCs refer to Intel processor-compatible computers running a version of Microsoft Windows.

Mouse Button Naming Conventions

An instruction to click the mouse button, refers to clicking the primary mouse button, usually the left button for right-handed mice and the right button for left-handed mice. The popup menu refers to the menu displayed when you click the secondary mouse button, usually the right button on right-handed mice and the left button on left-handed mice.

Third Party Licenses

MÄK software products may use code from third parties. This section contains the license documentation required by these third parties.

Boost License

VR-Link, and all MÄK software that uses VR-Link uses some code which is distributed under the Boost License. All header files that contain Boost code are properly attributed. The boost web site is: www.boost.org.

Boost Software License - Version 1.0 - August 17th, 2003

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The copyright notices in the Software and this entire statement, including the above license grant, this restriction and the following disclaimer, must be included in all copies of the Software, in whole or in part, and all derivative works of the Software, unless such copies or derivative works are solely in the form of machine-executable object code generated by a source language processor.

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libXML and libICONV

VR-Link and all MÄK software that uses VR-Link, links in libXML and libICONV. On some platforms the compiled libraries and header files are distributed with MÄK Products. MÄK has made no modifications to these libraries. For more information about these libraries please see the following web sites:

- The LGPL license is available at: <http://www.gnu.org/licenses/lgpl.html>
- Information about IconV is at: <http://www.gnu.org/software/libiconv/>
- Information about LibXML is at: <http://xmlsoft.org/>

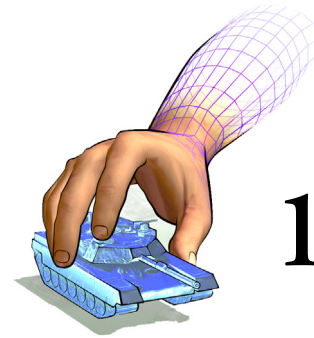
pThreads Library

VR-Exchange links with the pThreads win32 library. The library is distributed under the GNU Lesser General Public License (LGPL). MÄK has made no modification to this library. For information about the pThreads win32 library please see: <http://sourceware.org/pthreads-win32/>

EHS, PCRE, and PME

The MÄK RTI links with the EHS, PCRE, and PME libraries. These libraries are distributed under the GNU Lesser General Public License (LGPL). MÄK has made modification to these libraries only to allow them to compile on the supported platforms. For more information about these libraries please see the following web sites:

- EHS: <http://xaxxon.slackworks.com/ehs/>
- PCRE: <http://www.pcre.org/>
- PME: <http://xaxxon.slackworks.com/pme/index.html>



Creating and Running Scenarios

This chapter explains how to create, load, run, and save scenarios.

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1.1. Creating a Scenario

To use VR-Forces to simulate entities, you must load a scenario or create a new one. When you first start VR-Forces, the Startup Screen asks you if you want to create or load a scenario (unless you have disabled this feature). Thereafter, to create a scenario, use the procedure in this section. (For details about the Startup Screen, please see Section 5.1.1, “Starting VR-Forces from the VR-Forces Launcher”, in *VR-Forces Users Guide*.)



If you are using multiple front-ends in the same session, when one of them creates a scenario, the terrains in all other front-ends are closed (unless the terrain is the same as that for the new scenario) and the terrain for the new scenario is loaded.

To create a scenario:

1. Choose **File** → **New Scenario**, or click the New Scenario icon () on the File toolbar. The Choose Simulation Terrain dialog box opens (Figure 1-1). By default, it opens in *.userData/terrains*, the directory that contains the terrain files shipped with VR-Forces. For a brief description of the databases supplied with VR-Forces, please see Section 14.8, “Terrain Databases Provided with VR-Forces”, in *VR-Forces Users Guide*. For details about terrain files, please see Section 3.11, “Terrain Databases”, in *VR-Forces Users Guide*.

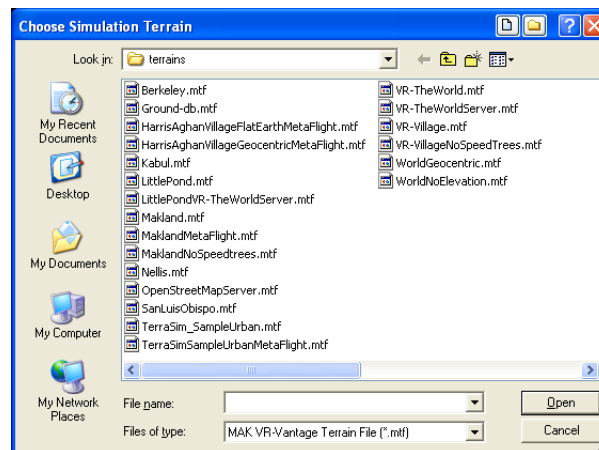


Figure 1-1. Select Simulation Database dialog box

2. In the file list, select a terrain database. (MTF is the preferred file type.) A database must be a flat earth, geocentric, UTM, or Lambert Conformal Conic database. By default, this terrain is used for both the front-end and back-end.



If you choose an MTF file and an MTD file with the same name exists, the back-end loads the MTD file. This is likely to be the case if you are using B-HAVE, since the back-end needs to load the PathData that is referenced by the MTD file.

3. Click Open. The New Scenario dialog box opens (Figure 1-2).

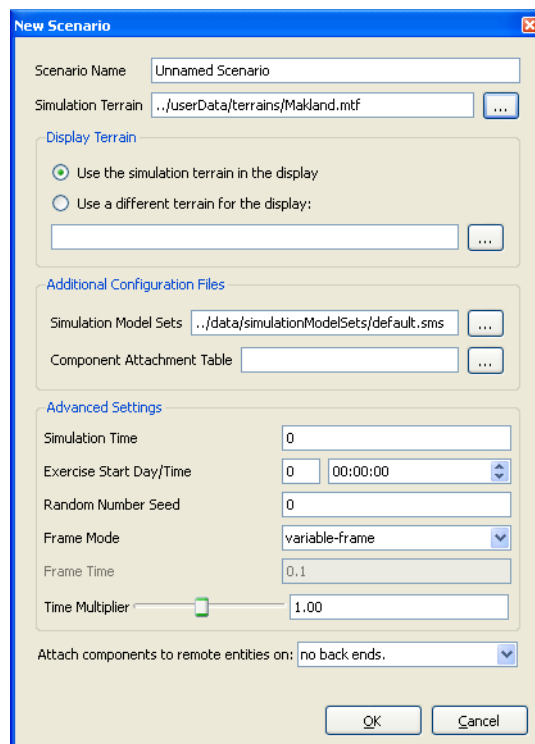


Figure 1-2. New Scenario dialog box

4. Optionally, set scenario parameters (overriding the default settings). [Table 1-1](#) describes the parameters you can set.

Table 1-1: Scenario parameters

Parameter	Description
Scenario Name	Specifies the name of the scenario. This is the name used to identify the scenario when you join a session. If you do not specify a name, the scenario file name is used.
Simulation Terrain	Specifies the terrain to be used by the back-end. By default, this is the terrain you selected in the Choose Simulation Terrain dialog box. However, you can change it if you want to.
Display Terrain	Specifies the terrain to be used by the front-end.
Simulation Model Sets	Specify one or more simulation model sets. A scenario must specify at least one simulation model set. For more information, please see “Specifying Multiple Simulation Model Sets,” on page 1-6. Default: <i>default.sms</i> .
Component Attachment Table	If you plan to attach components to remote entities, specify the component attachment table that you want to use. For details about configuring components for attachment to remote entities, please see “Configuring VR-Forces Components on Remote Entities,” on page 8-34, in <i>VR-Forces Configuration Guide</i> .
Simulation Time	Specify the starting simulation time in seconds.
Exercise Start Day/Time	Specify the starting exercise time by day and hour.
Random Number Seed	Specify a random number seed as an integer ≥ 0 .
Frame Mode	Select a frame mode from the list.
Frame Time	Specifies the length of a frame, in seconds. This parameter is not enabled if Frame Mode is variable-frame.
Time Multiplier	Specify a time multiplier for the scenario. For HLA time-managed federations, this parameter is ignored. Default: 1.0 (real-time).
Attach Components to Remote Entities On	Specifies whether or not to attach components to remote entities, and if so, the back-ends on which to manage the components that are being attached to remote entities. Unlike other scenario parameters, you can change this value when you load a scenario. For details about configuring components for attachment to remote entities, please see “Configuring VR-Forces Components on Remote Entities,” on page 8-34, in <i>VR-Forces Configuration Guide</i> .



This value is not saved in the scenario file. To attach components in future runs of the scenario, you must specify the appropriate setting each time you load the scenario.

For more information about these parameters, please see:

- Section 3.13.1, “[Simulation Time and Exercise Time](#)”, in *VR-Forces Users Guide*
- Section 3.13.2, “[Exercise Clock Modes](#)”, in *VR-Forces Users Guide*
- Section 3.2.1, “[Scenario Parameters](#)” in *VR-Forces Configuration Guide*.

5. Click OK. The terrain is displayed in the 2D view.
6. Add the entities and graphical objects that you need for your simulation. For information about adding entities and tactical graphics, please see Chapter 2, [Creating and Placing Objects](#).
7. Save the scenario. For details about saving scenarios, please see “[Saving a Scenario](#),” on page 1-12.

1.1.1. Specifying Multiple Simulation Model Sets

You can specify more than one simulation model set for a scenario. One strategy for extending VR-Forces is to use the default SMS for the majority of objects and to create a separate SMS for customized entities. As you upgrade to newer versions of VR-Forces, you can more easily migrate your customized SMS to the new version because your changes have not been integrated into the default SMS.

To specify multiple simulation model sets for a scenario:

1. In the New Scenario dialog box, click the Browse button on the Simulation Model Set line. The Simulation Model Set Files dialog box opens. It lists the SMS files to be loaded for this scenario.

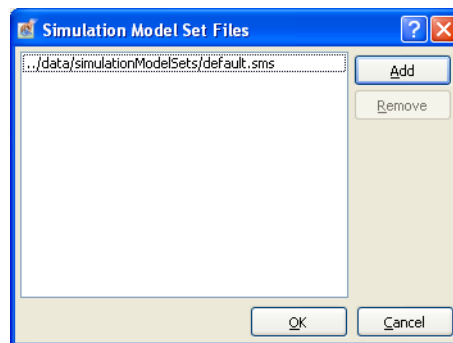


Figure 1-3. Simulation Model Set Files dialog box

2. In the The Simulation Model Set Files dialog box, click Add. A blank line is added to the window (Figure 1-4).

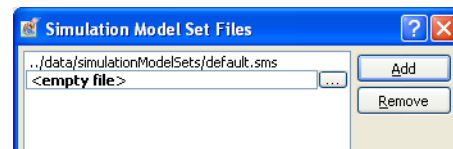


Figure 1-4. Add simulation model set

3. Click the browse button next to the blank line. The Choose File dialog box opens.
4. Select a simulation model set and click Open. The SMS is added to the text box.
5. Click OK.
6. Complete the New Scenario dialog box.

1.1.2. Merging Scenarios

VR-Forces users often assign scenario development to multiple persons or teams. Then they merge the separately-developed scenarios into a master scenario. Merging scenarios by hand can be a difficult task due to the requirement to reconcile entity and object names, plans, and other scenario elements that could be duplicated, particularly if objects are named using the default conventions. VR-Forces includes an offline tool, Scenario Merge, for merging scenarios. For details, please see Chapter B, [Merging Scenarios](#), in *VR-Forces Configuration Guide*.

1.2. Loading a Scenario

After you have created and saved a scenario, you can load it and run it on any platform supported by the version of VR-Forces in which you created it. Most scenarios are forward compatible. Please see *VR-Forces Release Notes* for compatibility issues.

i

- ♦ If you are running multiple front-ends in the same session, when you load a scenario, any terrains that are open on other front-ends are closed and the terrain for the newly loaded scenario is opened.
 - ♦ When you load a scenario that uses multiple back-ends, if any of the required back-ends are not running, VR-Forces prompts you to remap the objects in the scenario. The Remap Missing Back-ends dialog box lists the unavailable back-ends and the available back-ends. You can specify which back-ends to map objects to or you can select “map all to” and map all objects to one back-end. For more information about remapping back-ends, please see [Remapping Back-ends](#), under Section 3.2.5, “[Working with Multiple Back-ends](#)”, in *VR-Forces Users Guide*.
-

To load a scenario:

1. Choose **File** → **Load Scenario** or click the Open Scenario icon (📁) on the File toolbar. The Load Scenario dialog box opens (Figure 1-5).

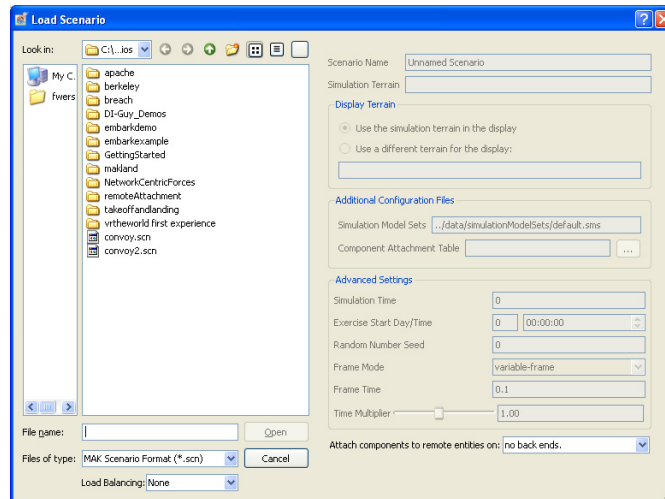


Figure 1-5. Load Scenario dialog box

2. Select a scenario to load. Scenarios are files with the suffix *.scn*. Sample scenarios are located in the *./data/scenarios* directory. (Batch scenarios, described in “Running VR-Forces in Batch Mode,” on page 1-17, have the suffix *.bsn*.)
3. Optionally, specify whether or not to allow management of components on remote entities by selecting an option in the Attach Components to Remote Entities On drop-down list. For details about configuring components on remote entities, please see “Configuring VR-Forces Components on Remote Entities,” on page 8-34, in *VR-Forces Configuration Guide*.
4. Optionally select a load balancing option.
5. Click Open.

1.2.1. Loading a Recently Loaded Scenario

VR-Forces keeps a list of the scenarios you open. You can quickly open a scenario from the list.

- To open a recently used scenario, choose **File** → **Recent Scenarios** → *scenario_name*.

1.2.2. Loading a Scenario from the Command Line

If you start VR-Forces from the command line, you can specify a scenario to load. You can specify the scenario in the back-end or front-end. The other executable will load it as soon as it starts up.

To load a scenario when you start the back-end, use the `-L` command-line option, for example:

```
vrfSimDIS -P 1234 -L "../data/scenarios/myScenario.scn"
```

To load a scenario when you start the front-end, use the `--scenarioFile` command-line option, for example:

```
vrfGui --scenarioFile "../data/scenarios/myScenario.scn"  
--dis -P 1234
```

1.2.3. Load Balancing a Scenario

After you create a scenario, you may decide that you want to spread simulation of objects across more back-ends than you used to create it. You would typically increase the number of back-ends to improve performance. The process of spreading the simulation work across multiple simulation engines is called load balancing. VR-Forces supports even distribution (done automatically by VR-Forces) and manual load balancing.



If you are using interest management to support large entity counts, do not enable load balancing. It will negate the assignment of entities to specific back-ends that is part of designing a scenario for interest management.

To load-balance a scenario:

1. Choose **File** → **Load Scenario**. The Load Scenario dialog box opens.
2. In the Load Scenario dialog box, select an option from the Load Balancing list (Figure 1-6).

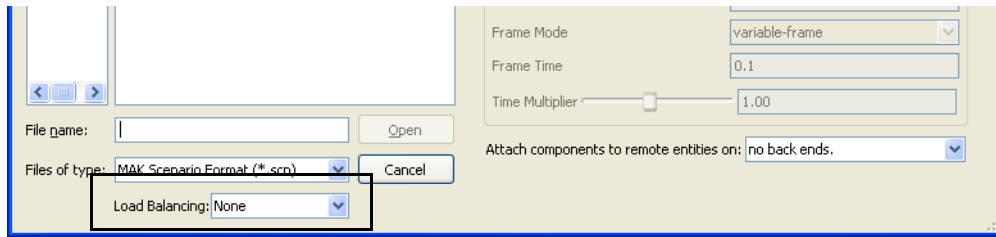


Figure 1-6. Load Balancing list

If you select Even Distribution, VR-Forces automatically distributes objects across the available back-ends. If you choose Manual load balancing, the Object Mapping dialog box opens ([Figure 1-7](#)).

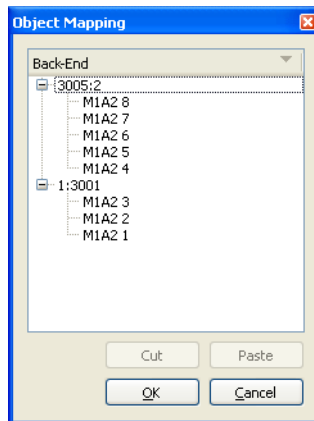


Figure 1-7. Object Mapping dialog box

3. In the Object Mapping dialog box, expand the list for the back-end from which you want to distribute objects.
4. Redistribute objects by dragging them from a source back-end to a target back-end, or by cutting them from the source back-end and pasting them onto the target back-end. You can view the new distribution of objects, as shown in [Figure 1-8](#), by expanding the list for the target back-end.

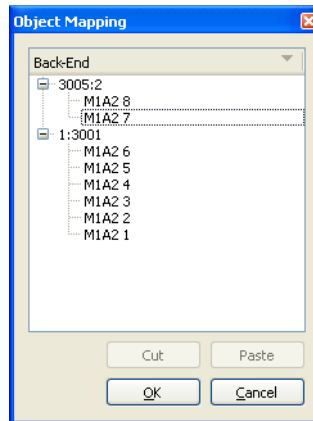


Figure 1-8. Object Mapping dialog box after load balancing

5. Click OK. The scenario loads. If you open the information dialog box for an object, the title bar displays the back-end on which it is simulated.
6. To preserve the new object mappings, save the scenario. When you save the scenario, you are prompted to save the original mappings. Click No to save the new load balanced mappings.

1.2.4. Sample Scenarios

VR-Forces includes several sample scenarios. Appendix A, [Example Scenarios](#) has the step-by-step process for creating the breaching scenario and the embarkexample scenario.

1.3. Saving a Scenario

The first time you save a scenario, VR-Forces saves the path of the terrain database and other scenario configuration data to a scenario file (extension *.scn*). (Paths are saved relative to the *.bin* directory.) This information usually does not change between runs of a scenario. Every time you save a scenario, VR-Forces saves the order of battle, the plans, and object mapping information to individual files that have the same name as the scenario, but with file extensions that identify the information in the file (*.oob*, *.pln*, *.gpl*, *.hst*, and *.omp*).



- If you want to keep the initial state of a scenario (simulation time = 0 and no simulation has taken place), so that you can repeatedly run a simulation from the beginning, save the scenario when you have finished creating it, but before you run it. Then, do not save the scenario again under the same name (unless you specifically want to change the original state of the scenario).
- If you load an alternate terrain in a front-end when it joins a session, the alternate terrain is not saved as part of the scenario.

When you save a scenario, whether during the course of setting it up or during a simulation, all state information gets saved. Essentially, every save is a checkpoint. Therefore, when you run a saved simulation, all entities will resume whatever they were doing when the scenario was saved.

If you save a scenario after it has started (whether it is paused or running), it is not saved to the original scenario file. It is saved to a checkpoint that is named using the convention *scenario_name_at_time_time.scn*. This ensures that you cannot inadvertently overwrite the original scenario file. To overwrite the original scenario, you must use Save Scenario As. For more information about checkpoints, please see [“Saving Checkpoints,”](#) on page 1-13.

To save a new scenario:

1. Choose **File** → **Save Scenario** or click the Save icon () on the File toolbar. The Save Scenario dialog box opens.
2. Select the directory in which you want to save the scenario.
3. Give the scenario a name.
4. Click Save. All scenario files are saved with the new name.



If you save a remapped scenario, you are prompted to save the scenario with the original mappings or with the remappings.

1.3.1. Saving an Existing Scenario

In most computer applications, when you save an existing file, the current version of the file simply overwrites the previously saved version. However, when VR-Forces saves a scenario, the save action depends on the status of the scenario. VR-Forces tracks the simulation time of the scenario. When you save a scenario:

- ♦ If a version of the scenario exists with the current simulation time, VR-Forces displays a message indicating that a version of the scenario at that simulation time exists and asks if you want to overwrite it.
- ♦ If there is no version with the current simulation time, VR-Forces creates a new checkpoint at the current simulation time, using the checkpoint naming convention.

This behavior ensures that if you change a scenario after you have started a simulation, you will never inadvertently overwrite the original version or another checkpoint.

➤ To save a previously saved scenario, choose **File** → **Save Scenario**.

1.3.2. Saving a Scenario to a New Name

To save a scenario to a new name:

1. Choose **File** → **Save Scenario As**. The Save Scenario dialog box opens.
2. Select the directory in which you want to save the scenario.
3. Give the scenario a name.
4. Click Save. The scenario is saved to the new name.

1.3.3. Saving Checkpoints

You may want to save snapshots of a simulation at various points in its life for after-action-review or to use as the starting point of a new exercise. You might also want to stop an exercise and resume it at some later point, with all entities remembering their tasks and state information. You can do this by saving a checkpoint.

You can save a checkpoint at any time by saving the scenario. Checkpoints are saved to the same directory. You can also configure VR-Forces to save checkpoints at regular intervals. If periodic checkpointing is enabled, the Status bar displays the time until the next checkpoint.

When you run a checkpointed scenario, entities resume the tasks that they were executing at the time the checkpoint was saved. If detonations were scheduled or if missiles were in flight, they resume their former state.

Saving an Individual Checkpoint

Whenever you save a scenario, it creates a checkpoint.

- To save an individual checkpoint, choose **File** → **Save Scenario**.

Scheduling Periodic Checkpoints

You can configure VR-Forces to save checkpoints at regular intervals. You can specify that the intervals be calculated in real time or simulation time. Saving checkpoints in simulation time may be useful if you are running a scenario at a rate greater or lesser than real time.

To schedule checkpoints:

1. Choose **File** → **Schedule Periodic Checkpointing**. The Periodic Checkpointing dialog box opens (Figure 1-9).

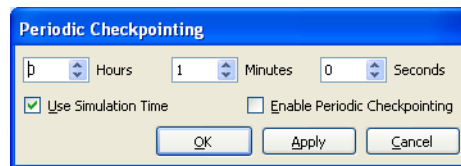


Figure 1-9. Periodic Checkpointing dialog box

2. Enter the time interval between checkpoints, in hours, minutes, and seconds.
3. Select the Enable Periodic Checkpointing check box.
4. To save checkpoints based on simulation time, check the Use Simulation Time check box. To use real time intervals, clear the check box.
5. Click OK.

Disabling Periodic Checkpointing

To disable periodic checkpointing:

1. Choose **File** → **Schedule Periodic Checkpointing**. The Periodic Checkpointing dialog box opens.
2. Clear the Enable Periodic Checkpointing check box.
3. Click OK.

1.3.4. Deleting Checkpoints

You can delete checkpoints individually, like you can delete any other files on your computer. You can also easily delete them from the front-end.

To delete checkpoints:

1. Choose **File** → **Delete Scenario Checkpoints**. The Delete Checkpoints dialog box opens (Figure 1-10).

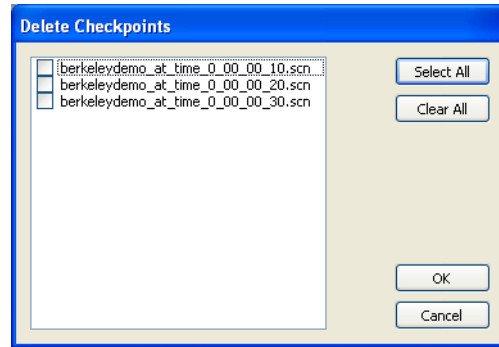


Figure 1-10. Delete Checkpoints dialog box

2. Select the checkpoints that you want to delete.
3. Click OK.

1.4. Starting a Simulation

If you want to use VR-Forces to simply observe a remote simulation, you can start it, open a terrain database, and wait for it to pick up messages from the network. However, you will probably use VR-Forces to run simulations that have locally simulated entities.

1.4.1. Starting or Resuming a Paused Scenario

When you load a scenario, it opens in the paused state unless you start with the `-L` and `-r` back-end command line options.

- To begin or resume execution of a paused scenario, choose **Simulation** → **Run Scenario**, or click the Run icon on the Simulation Control toolbar ([Figure 1-11](#)).



Always save a new scenario before you run it for the first time. If you do not save it, you will not be able to return to the starting point. Rewinding a scenario that has not been saved deletes all unsaved objects.

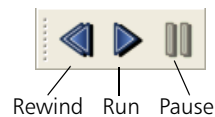


Figure 1-11. Simulation Control toolbar

1.4.2. Changing the Simulation Speed

You can vary the speed of a simulation so that it runs at speeds faster or slower than real-time.

If you are running VR-Forces with time management, the Simulation Time Scale toolbar has no effect on simulation speed.



If you increase the speed at which a scenario runs, the frame rate is reduced and performance of models may degrade.

- To change the speed of a simulation, drag the indicator on the Simulation Time Scale toolbar ([Figure 1-12](#)), or type a value in the text box.

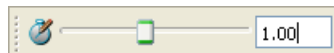


Figure 1-12. Simulation Time Scale toolbar

1.4.3. Pausing a Scenario

When you pause a simulation, local entities stop executing plans and tasks. Display of remote entity activity continues as it is received over the network.

- To pause a simulation, choose **Simulation** → **Pause Scenario**, or click the Pause button on the Simulation Control toolbar (Figure 1-11).

1.4.4. Rewinding a Scenario

If you are running a scenario or have completed a scenario and want to start it over again, you can rewind it. Rewinding a scenario returns it to its last saved state.



If you are working on a new scenario and have not saved it, rewind deletes all your work and returns the scenario to its original, blank state.



If you save checkpoints while a scenario is running, when you rewind, the scenario rewinds to the most recent checkpoint, not to the original scenario. To return to a version of the scenario other than the most recent checkpoint, you must load that version.

- To rewind a scenario, choose **Simulation** → **Rewind Scenario**, or click the Rewind button on the Simulation Control toolbar (Figure 1-11).

If you do not pause a scenario before you rewind it, it starts playing again immediately.

1.4.5. Closing a Scenario

- To close a scenario, choose **File** → **Close Scenario**, or click the Close Scenario icon (✕) on the File toolbar.

1.5. Running VR-Forces in Batch Mode

Batch mode allows you to run one or more scenarios multiple times, without direct action through the graphical user interface. A scenario run in batch mode runs with the parameters in the scenario file, except that you can override the random number seed.

Batch mode is “read only.” You cannot save a scenario, create entities or objects, pause the scenario, or otherwise change it, while a batch is running. However, you can view the Objects List Panel, Plan windows, and open informational dialog boxes. You can close a scenario that is running in batch mode and resume control of VR-Forces.

1.5.1. Creating a Batch File

To run VR-Forces in batch mode, you create a batch file (*.bsn*). VR-Forces supplies a sample batch file. Use it as a model for creating your own batch files.

To create a batch file:

1. Create scenarios as you would any scenario. (For details, please see [“Creating a Scenario,”](#) on page 1-2.)
2. In a text editor, open the sample batch file provided with VR-Forces.
3. Save the batch file under a new name, with the file extension *.bsn*.
4. Replace the sample values with your own, as described in [“Editing a Batch File,”](#) on page 1-18.
5. Save the new batch file.

1.5.2. Editing a Batch File

A batch file is written in MÄK Technologies Lisp format (MTL). (For information about the MTL format, please see Section 2.5, [“MÄK Technologies Lisp \(MTL\) Files”](#), in *VR-Forces Configuration Guide*.) A batch file starts with parameters that affect the entire batch. Then it has a batch list, which contains one or more batches. Each batch specifies a scenario, the number of times it is to be run, and other parameters. [Table 1-2](#) describes the parameters.

The following is an example of a batch file:

```
(scenario-batch
  (use-logger-control True)
  (logger-files-path "..\logger_tapes") ;; path is relative to Logger
  executable.
  (batch-list
    (batch
      (number-of-runs 2)
      (random-number-seed 4)
      (scenario-filename "..\data\scenarios\breach\breaching.scn")
      (parameter-filename
        "..\data\simulationModelSets\default\vrfSim.opd")
      (simulation-run-duration 0 : 0 : 0 : 30.000000) ;; simulation time
    )
    (batch
      (number-of-runs 3)
      (scenario-filename
        "..\data\scenarios\apache\apache_groundDB.scn")
      (parameter-filename
        "..\data\simulationModelSets\default\vrfSim.opd")
      (run-duration 0 : 0 : 0 : 20.000000) ;; real time
    )
  )
)
```

Table 1-2: Batch file parameters (Sheet 1 of 2)

Parameter	Description
Scenario-batch parameters	
use-logger-control	Specifies whether or not to generate Logger Control messages. Options: ♦ False – Do not generate messages. ♦ True – Generate messages to create Logger files for each run of each batch.
logger-files-path	If user-logger-control is True, specifies the directory in which to store Logger files. The path can be absolute or relative to the Logger executable.
Batch-list parameters	
number-of-runs	Specifies how many times to run the scenario in this batch run entry.
random-number-seed	This parameter is optional. If it is specified, it overrides the random number seed in the scenario file. It specifies a random number seed as follows: ♦ -1 – use a value generated by the computer. Values are different for each run of this batch. ♦ Any non-negative integer – use the number specified for each run of the batch.
scenario-filename	Specifies the scenario to be run in this batch run entry. The scenario can be specified as an absolute path or a path relative to the directory in which the executable is located.
parameter-filename	This parameter is optional. If it is specified, it overrides the object parameter database specified by the scenario and specifies the object parameter database file to use.

Table 1-2: Batch file parameters (Sheet 2 of 2)

Parameter	Description
simulation-run-duration	Specifies the duration in simulation time that the simulation will run. It is mutually exclusive with run-duration. If both are specified, VR-Forces uses simulation-run-duration.  Specify hours, minutes, and days as integers, for example 15. Specify seconds as real numbers, for example, 15.0.
run-duration	Specifies the duration in real time that the simulation will run. For example, if a scenario has a time scale set to 2 (twice real time), and a run-duration of 10 minutes, 20 minutes of simulation time will elapse before the batch stops running this scenario. It is mutually exclusive with simulation-run-duration.  Specify hours, minutes, and days as integers, for example 15. Specify seconds as real numbers, for example, 15.0.

1.5.3. Running VR-Forces in Batch Mode

To run VR-Forces in batch mode:

1. Start VR-Forces. If any of the scenarios you plan to run in batch mode require multiple back-ends, start the back-ends with the required site and application IDs.
2. If you are going to generate Logger control messages, start the MÄK Logger.
3. Choose **File** → **Load Batch File**, or click the Load Batch File icon () on the File toolbar. The Load Batch File dialog box opens.
4. Select the batch file you want to run.
5. Click Open.

VR-Forces begins running the first scenario in the batch file. When VR-Forces finishes running the batch file, it closes the final scenario.



- ♦ When VR-Forces runs a batch file, if it cannot load a scenario specified in the file, it skips the scenario and goes to the next batch entry in the file.
- ♦ Automatic remapping is always enabled for batch mode.

Running in Batch Mode from the Command Line

If your scenarios only need one back-end, you can run a batch file from the command line.

- To run a batch from the command line, use the `-B` parameter, with the back-end in separate mode.

```
vrfSim -B "../data/scenarios/batchfile.bsn"
```

The scenario begins to run automatically.

1.5.4. Recording Batch Scenarios

You can generate Logger Control messages and save scenario output to a Logger file. You must start the Logger before you run the batch scenario.

If you generate Logger Control messages, each simulation is saved individually by the Logger, with a filename in the format:

```
<batch_scenario_name>_<scenario_run_number>_<random_number_seed>.lgr
```

You can specify the directory in which you want the Logger file to be saved.

The MÄK Logger does not record batch file runs if a previous recording exists. By default, the Logger does not allow you to overwrite existing files using the remote control API. So, once you record a batch run, you cannot record a subsequent run of the same batch. You can work around this problem by editing the *lgrConfig.xml* file to permit overwriting of Logger files. Make the following edits in the configuration file for each protocol for which you want to record batch runs:

Add the following lines to the `<defaults>` section:

```
<var name="processRemoteControl" type="bool" value="true"/>
<var name="recordRemoteControl" type="bool" value="true"/>
<var name="allowDeleteRemoteControl" type="bool" value="true"/>
```

Add the following lines to the `<commands name="startup">` section:

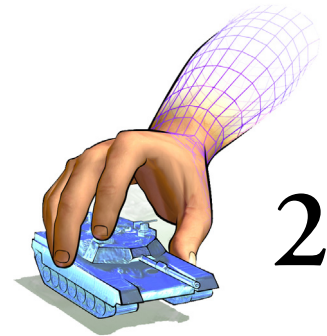
```
<command domain="Simulation" protocol="DIS"
  command="SetRemoteControlSettings">
  <param name="process" var="processRemoteControl"></param>
  <param name="record" var="recordRemoteControl"></param>
  <param name="allowDelete" var="allowDeleteRemoteControl"></param>
</command>
```

Use the appropriate value for the protocol attribute.

1.6. Recording VR-Forces Simulations with the MÄK Logger

You can use the MÄK Logger to record VR-Forces simulations and then play them back for review. If you want to view a Logger file in VR-Forces (as opposed to some other MÄK viewer, such as the VR-Vantage Stealth), note the following considerations:

- When you view the Logger file, you must run VR-Forces with an application number that is different from the one you used when you recorded the simulation. If you use the same application number, VR-Forces may crash.
- Do not load the original scenario in VR-Forces while you view the recording. Just load the terrain database that the simulation requires.
- If you are using HLA 1516, do not record a simulation and then immediately play it back. Exit the applications and start a new federation. Trying to play back the file in the federation from which it was recorded can result in name reservation conflicts and applications may crash.



Creating and Placing Objects

This chapter describes generic procedures for creating and placing entities and tactical graphics. The later chapters assume that you are familiar with these procedures.

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2.1. Creating Objects

VR-Forces lets you create entities, cultural features, tactical graphics, and props. You can create entities, cultural features, and tactical graphics from the Create menu or the Entity Palette. You create props from the Prop Palette. The procedures for creating these objects are all essentially the same. This chapter covers the common procedures. Additional procedures specific to the object type are described in later chapters.

When you create objects, you can create them quickly using the default naming scheme and using the mouse to specify the location, or you can specify these and other properties in a dialog box.

When you create an object, VR-Forces adds a tab to the right side of the window, below the Entity Palette and Prop Palette. The tab is labeled Create *object*, where *object* is whatever object you selected to create. If you click that tab, it opens a dialog box that lets you specify the properties of the object you are creating. [Table 2-1](#) lists the properties that you can set for each object type. You can also edit these same properties after you create an object.

Table 2-1: Editable object properties

	Name	Location	Heading	Overlay
Entity	X	X	X	
Cultural feature	X	X	X	
Tactical graphic	X	X		X
Prop		X	X	

2.1.1. Selecting the Object to Create

You can select the object to create on the Create menu, the Entity Palette, or the Prop Palette. Once you have selected the object, placing the object is the same regardless of how you started the process. For details, please see [“Placing Objects,”](#) on page 2-6.



All tactical graphics created from the Create menu are assigned to the Neutral force. If you want a tactical graphic to be assigned to a different force, create it from the Entity Palette.

Selecting the Object to Create on the Create Menu

You can create entities, cultural features, and tactical graphics from the Create menu.

To select the object to create on the Create menu:

1. If you are using multiple simulation engines, in the Selected Simulation Engine toolbar select the simulation engine on which you want to simulate the object.
2. To create a tactical graphic, choose **Create** → *graphic_type*, where *graphic_type* is a waypoint, route, phase line, obstacle or one of the types of areas.

To create an entity or cultural feature, choose **Create** → *category* → *ForceType* → *object_type*, where:

- *category* is a category of entity, such as Ground or Lifeform, or a category of cultural feature (Building or Cultural Feature)
- *ForceType* is Friendly, Opposing, or Neutral
- *object_type* is a specific type within the category, such as M1A2 or T80.

The cursor changes to create mode and a Create Object tab is added to the window.

3. Create the object, as described in “Placing Objects,” on page 2-6.

Selecting the Object to Create on the Entity Palette or Prop Palette

You can create entities, cultural features, and tactical graphics from the Entity Palette. You can create props from the Prop Palette. [Figure 2-1](#) shows the location of the Entity Palette and Prop Palette.

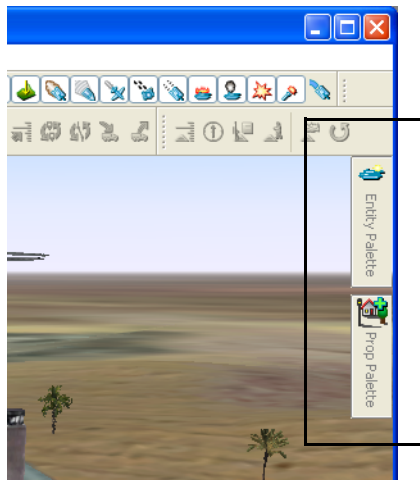


Figure 2-1. Object creation palette tabs

To select the object to create on the Entity Palette or Prop Palette:

1. If you are using multiple simulation engines, in the Selected Simulation Engine toolbar select the simulation engine on which you want to simulate the object.
2. Click the tab for the palette you want to open. The palette is displayed (Figure 2-2).

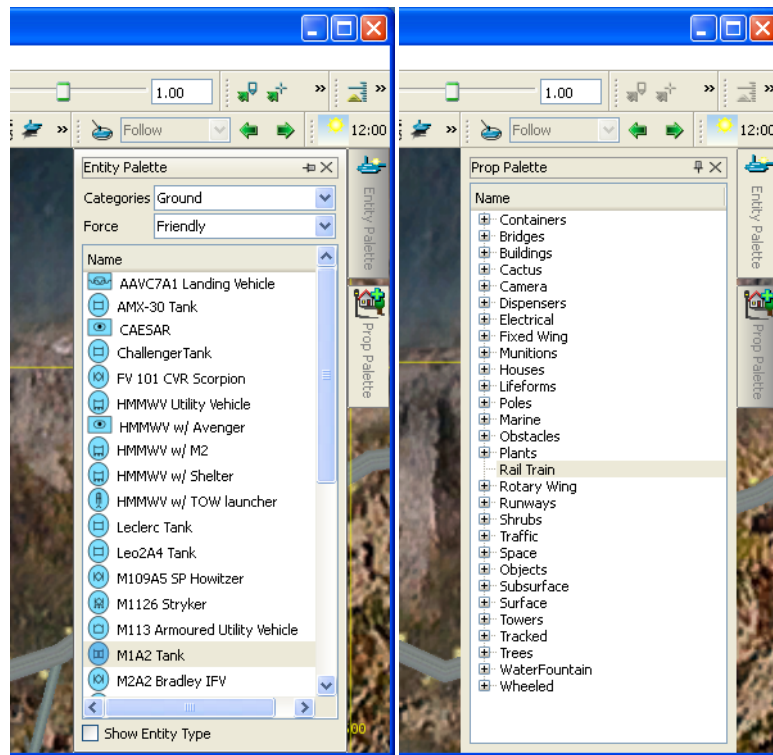


Figure 2-2. Entity and Prop palettes

3. If you selected the Entity Palette:
 - a. In the Categories drop-down list, select the category of object you want to create, for example, Ground, Aggregate, or Control Object. The list updates to show the objects of this type and the currently selected force that are available to create.
 - b. In the Force drop-down list, select the force for the objects that you want to create. The list updates to show the objects for this force and the selected category that are available to create.
 - c. Optionally, select the Show Entity Type check box to add entity type enumerations to the names in the list.

If you selected the Prop Palette, expand the hierarchy to list the type of prop that you want to select.

4. Click the object that you want to create. The cursor changes to create mode and a Create Object tab is added to the window.
5. Create the object, as described in “Placing Objects,” on page 2-6.

Pinning the Entity Palette or Prop Palette

Ordinarily, after you select the object to create from the Entity Palette or the Prop Palette, the palette closes. However, you can pin the palette to keep it open so that you can select additional objects to create without needing to click the palette’s tab to reopen it. If you pin a palette, it becomes dockable and undockable and you can drag it off the window like the other panels. (For details about undocking panels, please see Section A.1, “Dockable Panels and Toolbars”, in *VR-Forces Users Guide*.)

- To pin a palette so that it stays open after you select an object, click the pin icon (📌) in the title bar (Figure 2-3).

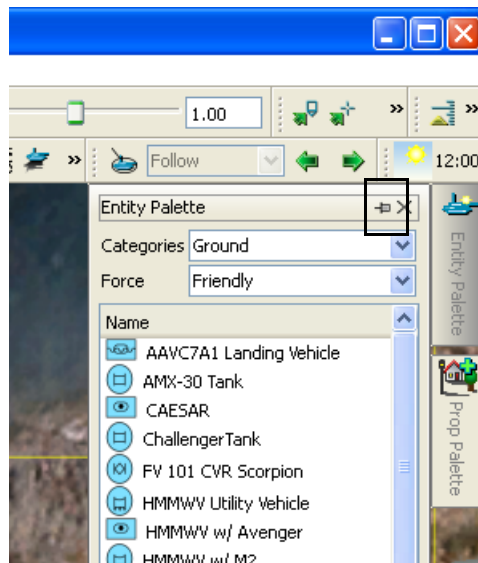


Figure 2-3. Palette pin

2.1.2. Placing Objects

When you select the object that you want to create, the Create Object tab is added to the right side of the window below the Prop Palette. If you are creating an entity or a cultural feature, in the 2D view, the cursor changes to a 2D icon that represents the chosen entity (Figure 2-4). In the 3D view, the cursor changes to the 3D model for the chosen entity (Figure 2-5). If you are zoomed out, 3D models may be hard to see.

If you are creating a tactical graphic, the cursor changes to show a vertex symbol.

If you are creating a prop, the cursor changes to show the model for the prop. In the 2D view, the model is a top down view and is proportional to the terrain, so it may be difficult to see if you are zoomed out.

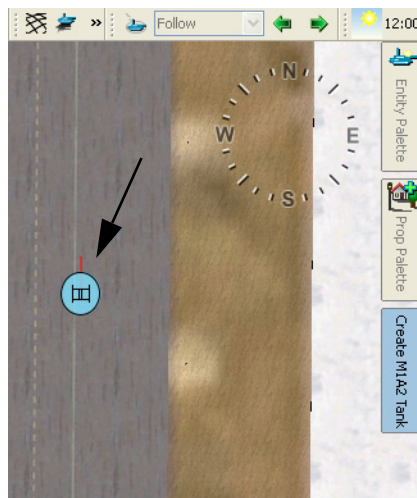
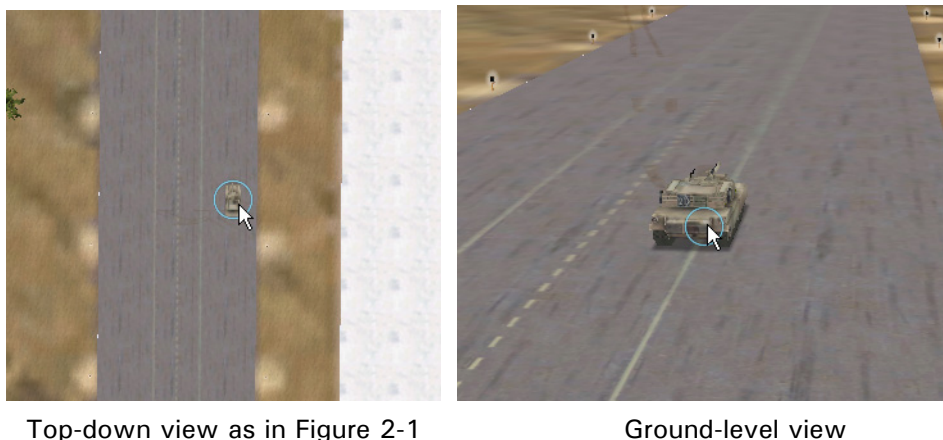


Figure 2-4. 2D entity creation and Create *Object* tab



Top-down view as in Figure 2-1

Ground-level view

Figure 2-5. 3D entity creation

There are two basic methods for placing entities, as follows:

- ♦ **Click to Create.** Each mouse click creates an instance of the selected object. The create object graphic is attached to the mouse cursor.

For multi-vertex tactical graphics, each click specifies a vertex. Click to Create is best for rapidly creating objects using the default values for the object's properties. Although you can use the Create Object dialog box to specify an object's name or other properties, as you move the cursor into the dialog box, the creation location (as represented by the object graphic) moves with it, which can be disconcerting. You can set heading and altitude dynamically, so there is no need to use the Create Object dialog box for these properties.

- ♦ **Click to Locate.** Mouse clicks specify the X, Y location, but do not cause the entity to be created. The create object graphic is placed at the X, Y location, but is not attached to the mouse cursor.

If you want to explicitly set the object's location, and particularly if you want to set the altitude relative to sea level, you must use this method. This method may also be more comfortable for persons who want to take a deliberative approach to specifying an object's properties before creating it.

Placing an Object Using Default Values (Click to Create)

Although you can specify an object's properties using the Click to Create method, it is best suited for quickly creating objects using default properties.

To place an object with each mouse click:

1. Select the object that you want to create as described in [“Selecting the Object to Create,”](#) on page 2-2.
2. For entities and waypoints, click on the terrain for each object you want to place. You can create multiple single point objects without exiting create mode. For details about disabling this create mode, please see [“Locking the Mouse to the Object Being Created,”](#) on page 2-13.

For multi-vertex tactical graphics, click on the terrain to place each vertex. Right click to place the last vertex in a route or area. (Do not try to close areas by clicking on the starting point. Doing so only creates another vertex near the first one.)



- ♦ If new objects or vertices do not get displayed as you click, it is possible that Attach Object to Mouse is disabled. To restore Click to Create mode:
 1. Click the Create Object tab. The Create Object dialog box opens.
 2. Select the Attach Object to Mouse check box.
- ♦ If tactical graphics are not displayed after you create them, check to see if the display of tactical graphics has been disabled. For details, please see Section 6.3, “[Showing and Hiding Tactical Graphics](#)”, in *VR-Forces Users Guide*.

3. Optionally, you can set the altitude of an object as you create it. For details, please see “[Setting Altitude Dynamically](#),” on page 2-10.
4. Optionally, you can set the heading of an object as you create it. For details, please see “[Specifying an Object’s Heading Dynamically](#),” on page 2-13.



If you want to specify any of the object’s properties in the Create Object dialog box while using Click to Create, you can do so. However, be aware that as you move the cursor into the dialog box, the object graphic will move also. Once you specify the desired properties, click on the terrain to create an object with those properties. The properties will be applied to any additional objects you create until you change them or close the dialog box.

5. Right-click to exit create mode.

Specifying an Object’s Properties Before You Create It (Click to Locate)

In the Click to Locate method, clicking on the terrain sets the X, Y coordinates of the object, but does not create it. You can specify all of the object’s properties in the Create Object dialog box before creating it.



VR-Forces remembers how you use the Create Object dialog box on a per-object basis. For example, if you create a waypoint and open the Create Waypoint dialog box to specify its properties, the next time you create a waypoint, the Create Waypoint dialog box opens automatically. If the dialog box opens and you do not want it open for this object creation or for future creations of the current object type, click the Create Object tab. The dialog box will close and VR-Forces will still be in object creation mode. The next time you create this object type, the dialog box will not open automatically.

To specify the properties of an object when you create it:

1. Select the object that you want to create as described in [“Selecting the Object to Create,”](#) on page 2-2. A Create Object tab is added to the window below the Prop Palette ([Figure 2-4](#)).
2. Click the Create Object tab. A Create Object dialog box that is appropriate for the object opens ([Figure 2-8](#)).

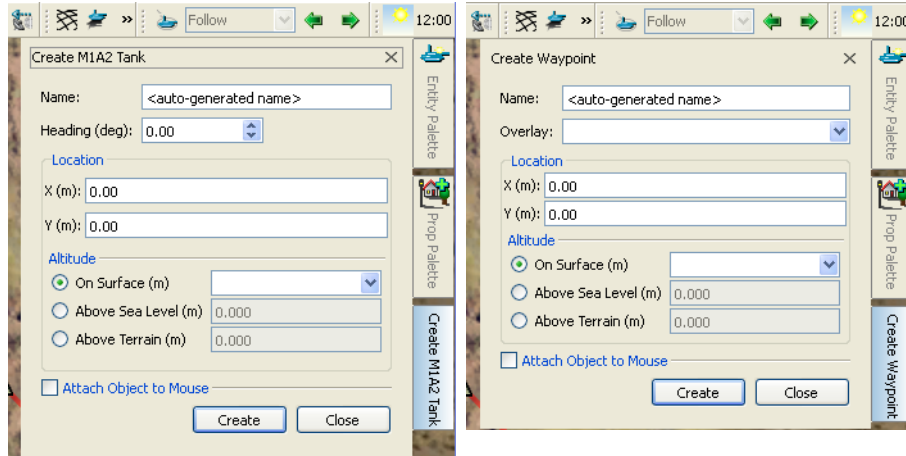


Figure 2-6. Create Object dialog boxes

3. Clear the Attach Object to Mouse check box. For details about this option, please see [“Locking the Mouse to the Object Being Created,”](#) on page 2-13.
4. To specify an object’s name, type a name in the Name box. For details about how entities are named, please see Section 3.5.1, [“How Entities are Identified”](#), in *VR-Forces Users Guide*.
5. To specify an object’s heading, type a value, in degrees, in the Heading box, or use the spinner control to set the heading.
6. To specify the overlay on which to place a tactical graphic, select an overlay from the Overlay drop-down list.

7. To specify an entity or point object's X, Y coordinates, click on the terrain or type X and Y values in the X and Y boxes. To specify the altitude, follow the procedure in [“Specifying an Object's Altitude,”](#) on page 2-10.

To specify the vertices of a route or area:

- a. Click on the terrain to place the first vertex, or type the X, Y coordinates in the dialog box.
 - b. Click the Add icon (✚) to add a vertex.
 - c. Click to locate the vertex or type the X, Y values.
 - d. Continue adding vertices until you are finished specifying the route or area. You can insert vertices anywhere in the object by selecting an existing vertex and clicking the Add icon.
8. Click Create. The object is created. You can continue to create additional objects of this type.
 9. To close the dialog box, click Close.

2.2. Specifying an Object's Altitude

You can specify an altitude for air platforms, sub-surface entities, the vertices of waypoints and routes, and props when you create them or edit their properties. You can also set altitude for entities using the Set Location set data request and the Move to Location task. You can set altitude dynamically or in the various dialog boxes for setting object properties or actions.

2.2.1. Setting Altitude Dynamically

You can set altitude dynamically for entities that support an altitude, for waypoints, for individual vertices of a route, and for props that have not been saved into a terrain. When you set altitude dynamically, you do not have to enter values in a dialog box. Altitude is set relative to the terrain.

To set altitude dynamically:

- ♦ If you are creating the object, press **Alt** and scroll the mouse wheel, or press **Alt**+left mouse button and drag the mouse.
- ♦ If you are editing an entity or vertex:
 - a. Double-click the object to make it editable.
 - b. Press **Alt** and scroll the mouse wheel, or press **Alt**+left mouse button and drag the mouse.
 - c. Click to set the new altitude.

2.2.2. Setting Altitude in the Create Object or Edit Object Dialog Box

When you set altitude in a dialog box, you have the following options:

- ♦ On Surface. On the surface at this location. For locations that have multiple polygons, you can choose the polygon on which to place the entity.
- ♦ Above Sea Level. The distance above sea level. If the terrain is higher than the altitude entered, the entity will be below the surface of the ground.
- ♦ Above Terrain. The distance above the terrain at this location.

If you are creating or editing a route, you can adjust the altitude of all of the vertices at the same time and in the same way. For details, please see [“Specifying the Altitude for All of the Vertices in a Route,”](#) on page 2-12.

To set altitude in a dialog box:

1. If you are creating or editing an object:
 - a. Click the Create Object (or Edit Object) tab. A dialog box opens.
 - b. Clear the Attach Object to Mouse check box. The Location group box becomes enabled. (Although the entity will change its location as you move the cursor into the dialog box, it snaps back to its original location as soon as you clear the check box.)

In all other cases, for example Set Location, the options are always enabled.

2. In the Altitude group box, select one of the options. If you select On Surface, select a surface from the drop-down list. If you select one of the other two options, type an altitude in the box.

2.2.3. Specifying the Altitude for All of the Vertices in a Route

When you create a route or edit its vertices, you may want to change the altitude of all of its vertices in a similar way. VR-Forces lets you:

- ♦ Adjust all vertices by the same number of meters
- ♦ Set all vertices to the same height above sea level
- ♦ Set all vertices to the same height above the terrain.

To change the altitude for all of the vertices in a route:

1. If you are creating a route, open the Create Route dialog box. If you are editing a route:
 - a. Select the route.
 - b. Choose **Entities** → **Edit**. The Edit Route dialog box opens.
2. Click the Adjust Points icon (📍). The Adjust All Points dialog box opens (Figure 2-7).

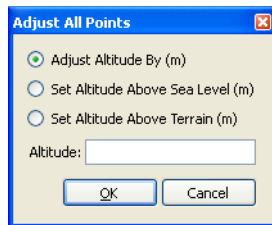


Figure 2-7. Adjust All Points dialog box

3. Select the adjustment action as follows:
 - Adjust Altitude By. Changes the altitude of each vertex by the number of meters specified in the Altitude box.
 - Set Altitude Above Sea Level. Sets the altitude of each vertex to the number of meters above sea level specified in the Altitude box. This could result in some vertices being below ground.
 - Set Altitude Above Terrain. Sets the altitude of each vertex the number of meters above the terrain specified in the Altitude box.
4. Type the desired altitude adjustment value, in meters, in the Altitude box.
5. Click OK.

2.3. Specifying an Object's Heading Dynamically

When you create an entity, cultural feature, or prop, you can set its heading in the Create Object dialog box, or dynamically. Afterwards, you can edit an entity or cultural feature's heading directly or use the Set Heading set data request. (For more information, please see [“Set Heading,”](#) on page 7-16.)

- To set an object's heading dynamically as part of the creation process, hold down the **Shift** key and the left mouse button, and drag the mouse.

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In the 2D view, as you change the heading for an entity you can see the heading indicator change heading. If you are setting the heading of a prop and you are zoomed in enough to see the model, you can see it rotate as you change the heading. However cultural features do not have heading indicators, so if you want to set the heading dynamically, you may want to switch to 3D view so that you can see the model rotate.

2.4. Locking the Mouse to the Object Being Created

By default, when you create entities or waypoints, you can create multiple objects by continuously left-clicking without exiting create mode. This is a very convenient feature if you want to create objects using default naming conventions and do not need to specify specific location coordinates or overlay assignments during the creation process. (You can always edit an object's properties after you create it.)

However, if you want to use the Create Object dialog box to specify location or other properties for each object as you create it, this feature can be inconvenient because as you move the mouse to the Create Object dialog box, the placement location changes with the mouse movement. Disabling this feature can give you greater control over the creation process, because clicking to set the location of the object or a vertex does not create it – it sets the X, Y values, but lets you make further changes in the Create Object dialog box before you create the object.

If you disable an object's attachment to the mouse when you are creating objects, you create them by clicking the Create button rather than clicking on the terrain.

- To enable or disable the mouse's attachment to the creation location, in the Create Object or Edit Object dialog box, select or clear the Attach Object to Mouse check box ([Figure 2-8](#)). The setting gets carried over to future object creations.

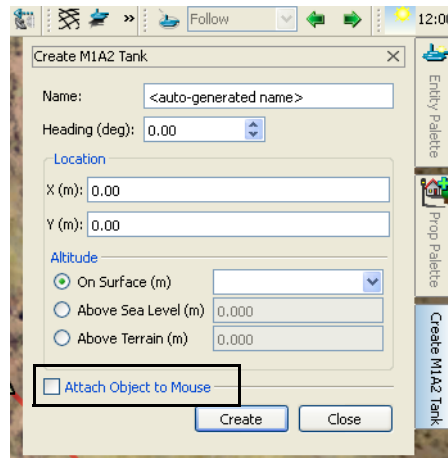


Figure 2-8. Create Object dialog box

2.5. Moving Objects

You can move an object by dragging it, changing its location in the Edit Object dialog box, or for entities only, sending a Set Location request.

For information about setting the location of an entity, please see “[Set Location](#),” on page 7-19.



You can only move objects simulated by VR-Forces.

2.5.1. Dragging an Object to a New Location

To drag an object from one point on the terrain to another:

1. Double-click the object, or select the object and choose **Entities** → **Move**.
2. Move the mouse to change the location of the object.
3. Left-click the mouse.



You can drag multiple objects of different types.

Canceling a Drag-and-Drop Move

- To cancel a move made by dragging an object, press **Escape** before you click the left mouse button.

2.6. Copying and Pasting Objects

You can copy objects and paste the copies elsewhere in a scenario or even in another scenario. The Paste Special option allows you to specify which entity characteristics you paste.

VR-Forces copies the following data about an object:

- ♦ Environmental objects:
 - Original name
 - Label
 - Force
 - Color
 - Appearance (line width, fill style, and so on)
- ♦ Entities:
 - Original name
 - Label
 - Force
 - Heading
 - Appearance (lights, landing gear, and so on)
 - Rules of engagement
 - Plan
- ♦ Aggregate entities copy the same information as individual entities plus the list of subordinates.

VR-Forces does not copy:

- ♦ The current task.
- ♦ State information, except as noted previously.
- ♦ Load balancing status. All objects get pasted into the currently selected back-end.
- ♦ Embarkation structures. If, for example, you copy an aircraft carrier that has planes embarked, only the carrier is copied, not the embarked entities.



The copy/paste process is resource intensive. It is primarily for use during scenario development. Use during a simulation could affect performance.

2.6.1. Copying Objects

To copy objects:

1. Select the objects you want to copy.
2. Choose **Entities** → **Copy**.

2.6.2. Pasting Objects

A simple paste pastes all of the attributes of an object that get copied. It pastes objects as follows:

- ♦ Tactical graphics are placed on the currently selected overlay. If you copied objects that were on different overlays, that differentiation is not preserved.
- ♦ Copied objects maintain the state at the time that they were copied. Therefore, if you paste objects some time after they were initially copied, the copies do not reflect any changes that may have taken place to the original entities. For example, if an entity was copied and then deleted, the copied version of the entity is still pasted.
- ♦ Embarkation structures are not copied, only the parent entity.



Pasting entity plans may have unexpected consequences, because their object references do not change when you copy them. For example, suppose the plan for Entity A refers to Waypoint 1. You copy Entity A and Waypoint 1 and paste them as Entity B and Waypoint 2. If you copy the plan, Entity B's plan will still refer to Waypoint 1. If you expected it to refer to Waypoint 2, you will not see the behavior you expected. You can choose not to paste plans. For details, please see [“Pasting Specific Entity Characteristics,”](#) on page 2-17.

To paste objects:

1. Choose **Entities** → **Paste**. The objects in the paste buffer are displayed on screen. They float as you move the cursor to show you where they will be placed when you paste them.
2. Click on the terrain where you want the objects to be pasted. They are pasted in the relative positions in which they were copied. If an object has an altitude, it is pasted using the same altitude above the terrain as the original object.
3. Optionally, continue pasting additional copies if desired.
4. Right-click to exit paste mode.

2.6.3. Pasting Specific Entity Characteristics

When you paste entities, you can specify which of the following entity characteristics you want to paste with the entity:

- ♦ Plans.
- ♦ Appearance.
- ♦ Heading.
- ♦ Rules of engagement.
- ♦ Entity name. (If you are pasting an entity in its original scenario, you must paste with a new name. However if you are copying it to another scenario, you might want to keep the same name.)
- ♦ Altitude. You can specify that the previous altitude be applied as above terrain or as above sea level.

To use Paste Special:

1. Choose **Entities** → **Paste Special**. The Paste Special dialog box opens.



Figure 2-9. Paste Special dialog box

2. By default, all check boxes are selected. Clear the check boxes for the options you do not want to paste. If you are pasting entities into the scenario from which they were copied, you must paste with new names. Clearing that option will cause the paste to fail.
3. Choose the altitude option that you want to use.
4. Click OK. The objects in the paste buffer are displayed on screen. They float as you move the cursor to show you where they will be placed when you paste them.
5. Click on the terrain where you want the objects to be pasted. They are pasted in the relative positions in which they were copied.
6. Optionally, continue pasting additional copies if desired.
7. Right-click to exit paste mode.

Pasting Altitude

When you paste objects, if the pasted object can have an altitude value, such as a fixed-wing entity, a waypoint, or the vertices of a route, the default behavior is to replicate the original altitude above the terrain. If you use the Paste Special operation, you can choose to apply the original altitude as being above sea level. [Figure 2-10](#) illustrates these alternatives. A waypoint is placed on the terrain. It is 0 meters above the terrain. However, the terrain itself is 200m above sea level. If the waypoint is copied and pasted at point A and the altitude above the terrain is maintained, the point is placed at 0m above the terrain. If the point is pasted at point B and altitude above sea level is maintained, it is placed 200m above sea level.

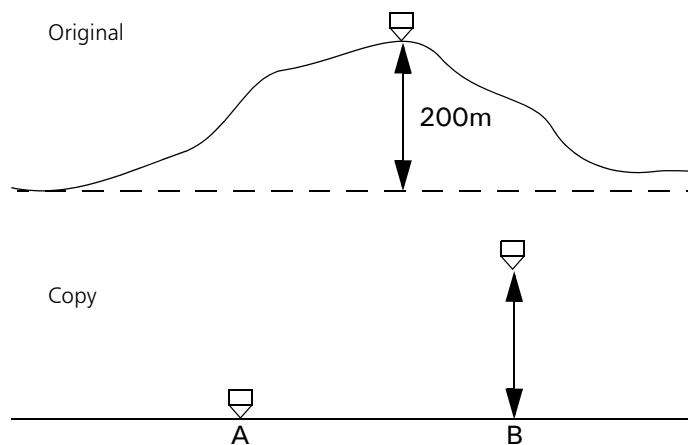


Figure 2-10. Pasting altitude

2.7. Creating Cultural Features

Cultural features are objects that you can add to a scenario to simulate human artifacts such as buildings, bridges, and so on. They are in the Building and Cultural Feature categories on the Create menu and the Entity Palette. You add them to a scenario the same way you would add an entity. Cultural features are listed in the Objects List Panel. You can apply some set data requests to them, such as Set Location and Set Heading.

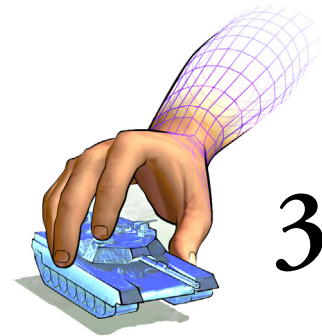


Some of the choices on the cultural feature lists are the same as those available on the Prop Palette. However, cultural features are not the same things as props. Props are terrain objects and can be saved as part of a terrain. Cultural features are not part of the terrain, they are a type of entity and are saved in the order of battle file.

2.8. Creating Props

Props are terrain objects that you can select independently of the terrain. Section 11.8.1, “[Extracting Props from a Terrain Patch](#)”, in *VR-Forces Configuration Guide* explains how to create them by extracting them from a terrain or a feature layer. However, you can also create them similarly to how you create entities. This is a valuable feature if your terrains do not have any features that you can extract as props. However note the following important details:

- ♦ Props are not saved in a scenario. If you want to save a prop, you must save the terrain. You can save the terrain to a different name or overwrite the existing terrain. The next time you open the terrain, the prop will be part of it.
- ♦ When you create a prop, the back-end does not know anything about it, because it is a terrain object. To have the back-end take the prop into account, you must save the terrain (as mentioned in the previous paragraph) and start a new scenario that uses the terrain.
- ♦ You can also create cultural features that look exactly like the props that you can create. However cultural features are not the same things as props. Cultural features are treated like entities. They are listed with entities and tactical graphics and get saved as part of the scenario.



Creating and Managing Entities

This chapter explains how to create and manipulate entities. For information about working with aggregate entities, please see Chapter 4, *Working with Aggregate Entities*. For information about managing entity information, please see Chapter 7, *Viewing Entities and Entity Information*, in *VR-Forces Users Guide*. For information about entity hostility relationships, target detection, and target acquisition, please see Chapter 9, *Target Detection and Combat Features*. For information about assigning tasks and set data requests to entities, please see Chapter 6, *Assigning Tasks* and Chapter 7, *Issuing Set Data Requests*.

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3.1. Creating Entities

The generic procedures for creating entities are described in Chapter 2, [Creating and Placing Objects](#). This section provides additional details about entity creation and placement.

You can also create entities by copying existing entities. For details, please see [“Copying and Pasting Objects,”](#) on page 2-15.

You can create pre-configured aggregates the same way you create individual entities. You can also create aggregates by aggregating existing entities. To learn how to create an aggregate, please see [“Creating Aggregates,”](#) on page 4-4.



When you create entities, if spot reports are enabled and a particular force is hidden, if you create an entity of the hidden force, you will not be able to see it. It is recommended that you disable spot reports or set the viewpoint to show all forces when you are creating scenarios. For details about spot reports, please see [“Displaying Entities Based on Spot Reports,”](#) on page 9-2.

The force ID of the entity is set to the type specified in the simulation model set.

3.1.1. Default Placement of New Entities

By default, ground, lifeform, rotary-wing, and fixed-wing entities get placed on the ground. Surface and subsurface entities are created at sea level.

Ground-based entities are placed at the highest possible terrain intersection at the location. If a terrain supports buildings with multiple levels, the entity is placed at the highest level. Once the entity begins moving, if the next calculated location resides in-between two levels of terrain, and if the entity is configured to respect terrain intersections when moving, and there is no terrain blocking its movement, the entity places itself at the closest elevation to the desired location.

3.1.2. Placing Entities Inside Buildings

One of the benefits of creating entities in a 3D observer mode is the ease of placing entities in the precise location and orientation that you want them to be in, particularly inside buildings. However, placing entities inside small enclosed spaces can be hindered by the location of walls relative to the observer. You can work around this problem by:

- ♦ Adjusting the near clipping plane to remove the display of walls and floors until you see the location where you want to place entities. For details about changing the clipping plane, please see Section 10.3.1, “[Setting the Clipping Planes](#)”, in *VR-Forces Configuration Guide*.
- ♦ Adjusting the transparency of a building so that you can see inside of it. For details about changing transparency, please see Section 11.8.5, “[Setting the Opacity of Props](#)”, in *VR-Forces Configuration Guide*.



If you enable view constraints, it may restrict your ability to move the observer into buildings. You can temporarily disable view constraints by pressing **x**.

3.1.3. Entity Resources

When you create an entity, it has a full complement of resources, as defined in the object parameter database. You do not have to assign resources to an entity when you create it. However, if you want an entity to start a simulation with less than a full set of resources, you could use Set Resource set data requests to set its resources at some amount less than 100%.

3.1.4. Deleting Entities

To delete an entity:

1. Select the entity you want to delete.
2. Choose **Entities** → **Delete** or press the **Delete** key.



- ♦ If you delete an aggregate entity, all its subordinates also get deleted.
 - ♦ If you delete an entity that has an intervisibility object pinned to it, the intervisibility object also gets deleted. For details, please see “[Deleting Intervisibility Objects](#),” on page 13-9, in *VR-Forces Users Guide*.
-

3.2. Editing Entities

You can edit the following entity properties:

- ♦ Name
- ♦ Location
- ♦ Heading
- ♦ Altitude.

To edit an entity:

1. Select the entity.
2. Choose **Entities** → **Edit**. The Edit Entity dialog box opens ([Figure 3-1](#)).

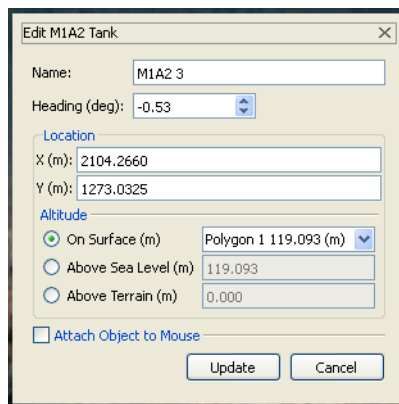


Figure 3-1. Edit Entity dialog box

3. Change the properties as desired.
4. Click OK.

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You can also change the location, altitude, and heading dynamically or with set data requests. For details, please see:

- ♦ “[Setting Altitude Dynamically](#),” on page 2-10
 - ♦ “[Specifying an Object’s Heading Dynamically](#),” on page 2-13
 - ♦ “[Moving an Entity](#),” on page 3-5
 - ♦ “[Set Altitude](#),” on page 7-4
 - ♦ “[Set Heading](#),” on page 7-16
 - ♦ “[Set Location](#),” on page 7-19.
-

3.3. Moving an Entity

To move an entity (change its location):

1. Double-click the entity or select the it and choose **Entities** → **Move**. The Edit Object panel opens.
2. Move the mouse to change the entity's location or type new values in the Edit Object panel.
3. Use **Alt**+mouse wheel or **Alt**+left mouse button+drag to change the altitude.
4. Click to place the object.

3.4. Embarking and Disembarking Entities

Embarkation places entities into or onto other entities, for example, dismounted infantry in a truck, trucks on an LCAC, or aircraft on an aircraft carrier. While embarked, the entities travel with the entity on which they are embarked. Embarked entities are not visible in the 2D view. They are always visible in the 3D view.



If you are using HLA and want to use the embarkation feature, you must use RPR FOM 2, draft 17. In Windows, VR-Forces includes configurations in the Simulation Connections Configuration dialog box that start VR-Forces using the correct FED file and FOM Mapper for RPR FOM 1.0 and RPR FOM 2, draft 17.

You can attach control objects to entities so that embarked entities can use them to move about on the parent entity. For example, an aircraft could taxi towards a waypoint on the flight deck of an aircraft carrier.



Attached objects are shown in the Embarkation View on the Objects List Panel.

The embarkation status of entities is displayed in the Embarkation tab of the Objects List Panel ([Figure 3-2](#)).

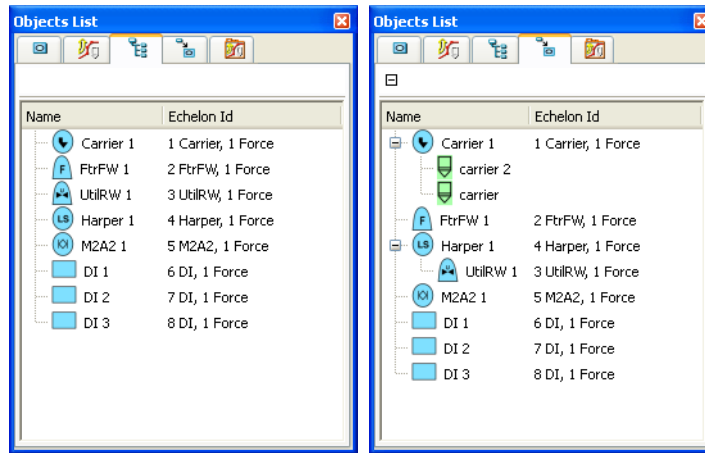


Figure 3-2. Echelon view and Embarkation view

You can embark and disembark entities instantly (described in this section), or you can have them simulate embarkation and disembarkation using the Embark and Disembark tasks, described in Chapter 6, *Assigning Tasks*.

When you embark an entity using the Embark task, the entity can embark only on entities that are configured to accept that type of entity. For example, LCACs are configured to accept several types of ground vehicles. You cannot give a DI an Embark task to embark on an LCAC. However, when you use the immediate embark method to embark an entity, you can use preconfigured slots (spaces) for entities or specify an override. When you specify an override you can embark an entity on any other entity at the coordinates you enter. However, it is your responsibility to know what the proper coordinates are.

3.4.1. Embarking and Disembarking Entities Instantly

You can embark and disembark entities instantly using commands on the Entities menu, using set data requests, or in the Embarkation View. Using set data requests lets you embed immediate embarkation in plans. This may be particularly useful in a global plan, in which you may want to quickly create and embark entities without paying attention to the realism of the action. For details about using set data requests for embarkation, please see “Set Embarked,” on page 7-11 and “Set Disembarked,” on page 7-10.

Embarking Entities Instantly Using the Embark On Command

The Embark On command lets you embark entities using preconfigured embarkation spaces or using specific coordinates. If the embarkation spaces on the parent entity are full, VR-Forces sends a message to the back-end console and the entity is not embarked. To embark entities instantly from a plan, use the Set Embarked set data request.

To embark an entity instantly using the Embark On command:

1. Select the entity that you want to embark.
2. Choose **Entities** → **Embark On**. The Embark On dialog box opens.

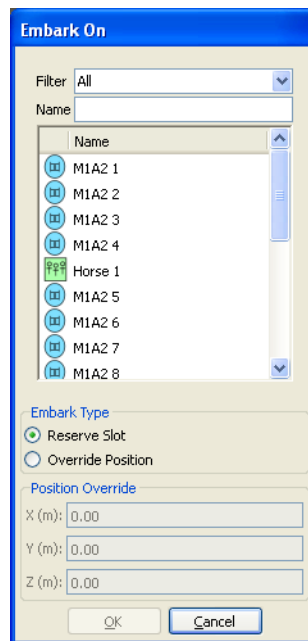


Figure 3-3. Embark On dialog box

3. Optionally, filter the list of potential parent entities.
4. Select the parent entity.

5. To embark in a configured space, select the Reserve Slot option. To specify an embarkation point, select Override Position.
6. If you chose the Override Position option, specify the X, Y, and Z values on the parent, in body coordinates, for the embarkation point.
7. Click OK.

Embarking Entities in the Embarkation View

To embark an object in the Embarkation View:

1. On the Objects List Panel, select the Embarkation view.
2. Drag the entity you want to embark onto the parent entity. The Embark On dialog box opens.
3. Click OK to embark using the Reserve Slot option.
4. To specify an embarkation location, select Override Position and specify the location.
5. Click OK.

3.4.2. Disembarking Entities Using the Disembark Command

Like the Embark On command, the Disembark command is typically used as part of scenario development. To simulate disembarkation, you would use the Disembark task. To provide instant disembarkation in a plan, you would use the Set Disembarked set data request.

To disembark an entity instantly:

1. Select the entity that you want to disembark.
2. Choose **Entities** → **Disembark**. If the entity was embarked using the default embarkation point, it is disembarked next to the former parent entity. If the entity was embarked using a position override, it is disembarked in the same location as the former parent.

To disembark an entity in the Embarkation View:

1. Open the Embarkation View.
2. Drag the entity you want to disembark off of the parent entity to the force level.

Disembarking All Entities

To disembark all entities from a parent entity:

1. Select the parent entity.
2. Choose **Entities** → **Disembark All**. All the entities are disembarked to locations spread out around the parent entity.

3.5. Collision, Obstacle, and Feature Avoidance

Many entity behaviors are built into their models. Collision and obstacle avoidance are among these behaviors. By default, entities avoid other entities and obstacle objects placed on the terrain (those created from the Create Obstacle menu option). If, while carrying out a task, a ground, lifeform, or rotary-wing entity detects that it is on course to collide with another entity or an obstacle, it alters its route to avoid the collision. Then it returns to its task.

When an entity avoids an obstacle, it does not necessarily follow the outline of the obstacle, it avoids the obstacle's bounding volume, which is conceptually the smallest rectangle that bounds all of the points in the obstacle.

Ground entities can also avoid features, such as buildings and plants. By default, entities avoid other entities, buildings, water, and vegetation. (LCACs do not avoid vegetation by default.)

Collision avoidance has the following qualifications:

- ♦ To specify that ground entities should not move through the terrain (for example, through a wall or through a hill), set the **check-terrain-collisions** parameter in the automotive actuator component (powertrain) to True. For performance reasons, it defaults to False, so that entities that do not care about terrain collisions do not perform the check.
- ♦ If an entity is tasked to move to a point that is inside an obstruction, or very close to one, it might never reach the point, but it will continue to try to reach the point as long as the task is in effect. This behavior also applies to entities following routes that have vertices inside an obstruction.
- ♦ If a terrain has geometric features as well as point vector features, the feature avoidance may not work because the points are placed on the terrain on “top” of the existing geometry, which means they are on top of the geometric feature.
- ♦ If Enable Road Driving (in Set Movement Strategy) is set to No, path following and obstacle avoidance may not work well together. Entities moving along a road may seek to avoid obstacles, such as trees or light posts, that are placed close to the road, even though they would not hit the obstacles as long as they stay on the road. To prevent this problem from occurring, the ground collision avoidance controller has been given a lower priority than the Move To Path controller. (For information about component priority, please see Section 7.2.2, “[Configuring the Priority of Components](#)”, in *VR-Forces Configuration Guide*.)

When the Movement Strategy is enabled (the default for ground entities), roadside obstacles are ignored. Entities react only to obstacles that block the road. For more information, please see “[Path Planning for Movement Tasks](#),” on page 6-7.

- ♦ Do not place entities inside obstacles. Their behavior will be unpredictable.
- ♦ Although you can assign a force to an obstacle when you create it, it has no effect on entity behavior. Entities avoid all obstacles.

You can configure the objects that an entity will avoid by editing its entry in the object parameter database. For details about configuring obstacle avoidance, please see Section 8.10, “[Configuring Obstruction Avoidance](#)”, in *VR-Forces Configuration Guide*.



The B-HAVE Module for VR-Forces, an extra-cost plug-in for VR-Forces provides improved collision avoidance using advanced AI techniques.

3.6. Entity Movement and Soil Type

In VR-Forces, the movement of entities is affected by the surfaces on which they are moving. The speed of movement over a given surface (as a percentage of ordered speed) is configured in the **soil-list** block in an entity’s object parameter database entry.

[Table 3-1](#) lists the soil types supported for terrain databases and how they map to the roughness types that can configured in the **soil-list** block for VR-Forces entities.

Table 3-1: Soil type/roughness type mappings

Soil type	Roughness type
ocean	deep-water
deepLake	deep-water
shallowLake	shallow-water
deepRiver	deep-water
shallowRiver	shallow-water
shallowPond	shallow-water
shallowStream	shallow-water
dryGround	hard-packed
pavedRoad	paved-road
gravelRoad	gravel
dirtRoad	gravel
asphalt	hard-packed
USRailroad	hard-packed
softSoil	sand
swamp	muck
mud	muck
forest	hard-packed
grass	hard-packed
cultivatedFields	hard-packed
orchards	hard-packed

Table 3-1: Soil type/roughness type mappings

Soil type	Roughness type
rock	rocks
boulder	rocks
sand	sand
building	hard-packed
tree	hard-packed

3.7. Using a Joystick to Control Entities

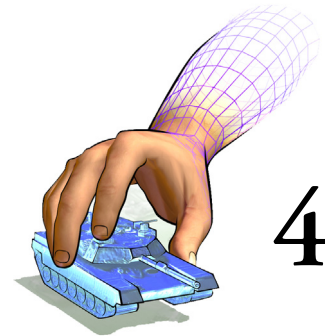
VR-Forces supports use of joysticks to control ground, fixed-wing, and rotary-wing entities. The default joystick parameters are specified in the file `.\appData\settings\vrSim\joyParam.dat`. (For details, please see Section 8.9, “[Configuring Joysticks](#)”, in *VR-Forces Configuration Guide*.) You can override the default values for specific entities by editing parameters for the joystick controller in the system definition file for an entity’s movement system.



- ♦ The joystick must be connected to the computer on which the entity is being simulated.
- ♦ You cannot enable or disable joystick support for all entities at once. You can only enable joysticks for individual entities.

To enable or disable joystick use:

1. Select the entity for which you want to enable or disable joysticks.
2. Choose **Entities** → **Enable Joystick** or **Disable Joystick**.



Working with Aggregate Entities

This chapter explains how to create and manage aggregate entities.

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Changing the Aggregation State at Runtime.....	4-3
Triggering Aggregate State Transitions.....	4-4
Creating Aggregates	4-4
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4.1. Introduction to Aggregates

It is important to understand the differences between an aggregate entity that is in the aggregated state and one that is in the disaggregated state. The types of aggregates are introduced in “Aggregate Entities,” on page 3-20. This section provides additional details about how aggregates function in the two different aggregation states.

4.1.1. How an Aggregate’s State is Shown

Aggregates publish their current aggregate state using the DIS/RPR FOM aggregate state enumeration. The current value for this parameter is displayed on the Aggregate Information page in an aggregate’s information dialog box (Figure 4-1). It can be accessed in the aggregate’s *DtVrfAggregateStateRepository* member.

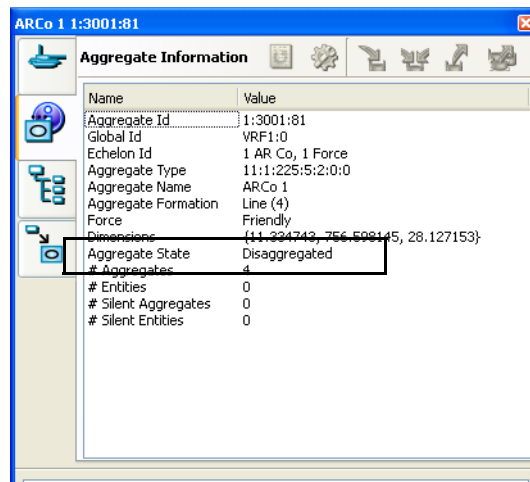


Figure 4-1. Aggregate Information page

Aggregated State

When an aggregate is in the aggregated state, its subordinates do not exist as distinct entities. It does not have any subordinates shown in the Echelon View or on the Subordinates tab of its information dialog box. It does not display ghosted icons for subordinates. You cannot expand or collapse it.

Disaggregated State

When an aggregate is in the disaggregated state, its subordinates are simulated as distinct entities. (However, it is possible to have a disaggregated aggregate with no subordinates.) Subordinates are displayed under the aggregate in the Echelon View and are listed on the Subordinates tab of its information dialog box. You can expand or collapse the aggregate view.

4.1.2. Changing the Aggregation State at Runtime

Aggregates can change their aggregation state at runtime. All state information maintained by the aggregate (for example, the current task it is executing, plan state, current resource levels) is maintained across the transition between aggregated and disaggregated states. This section describes how aggregates handle transitions for the most important activities.

Movement

All movement tasks can be executed in either aggregated or disaggregated state. Aggregates can transition between states at any time, without interrupting movement tasks. For example, suppose an aggregate in the disaggregated state, is executing a move-to-location task. While it is executing the task, you issue a Set Aggregate State set data request, indicating it should switch to the aggregated state. The aggregate transitions into the aggregated state (subordinates are deleted, and the state associated with them is mapped and stored internally in the aggregate), and continues moving toward its destination. Similarly, making a transition in the opposite direction while executing a movement task, does not interrupt the execution of that task.

Aggregates preserve their formation across aggregate state transitions.

Combat

Only disaggregated aggregates can engage in combat. However, an aggregate remembers any loss of resources or subordinates while it is aggregated. If a subordinate is destroyed while the aggregate is disaggregated, it will not be created again if the aggregate aggregates and then disaggregates again.

Resources

Resources are tracked and restored across state transitions. However, if a subordinate is destroyed while in the disaggregated state, then all of its resources are lost. They are not redistributed to other subordinates.

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When you restore an aggregate that is in the aggregated state (using Set Restore), the original configuration of the aggregate is recreated. If you restore an aggregate that is in the disaggregated state, then only those subordinates still present in the simulation are restored. Any destroyed subordinates that were previously removed from the simulation as result of a disaggregate-->aggregate-->disaggregate transition are not restored. To fully recover all subordinates, restore the aggregate while in the aggregated state.

4.1.3. Triggering Aggregate State Transitions

Aggregate state transitions can be initiated manually or automatically, as follows:

- ♦ **Manually:** You can send a Set Aggregate State set data request or use Aggregate and Disaggregate commands on the Entities menu. This immediately forces the aggregate to change state. As a set data request, state changes can be included in plans.
- ♦ **Automatically:** On the Aggregate Display Settings page of the Display Settings dialog box you can configure automatic aggregation and disaggregation. In automatic mode, aggregates automatically aggregate or disaggregate according to the following rules:
 - If the aggregate is within “disaggregation range” of a hostile entity or aggregate, the aggregate is in the disaggregated state. Disaggregation range is the range around an entity or aggregate in which you want to force any nearby aggregated entities to disaggregate so you can detect or engage them. This range is configurable for every type of entity and aggregate in the Entity Editor.
 - If the aggregate’s formation footprint (projection of its bounding extent in a topographic plane) overlaps a disaggregation area, the aggregate is in the disaggregated state. (A disaggregation area is a specific type of control object.)
 - If neither of the above conditions is in effect, the aggregate is in the aggregated state.

4.2. Creating Aggregates

You can create an aggregate by selecting existing entities (which can be individual entities or aggregate entities) and combining them to form an aggregate entity, or by placing a preconfigured aggregate from the Create menu.

When you create an aggregate, it is created as a subordinate to the force level. You cannot create aggregates that are subordinates of an existing aggregate. Once you create an aggregate, you can subordinate it to another aggregate. (For details, please see [“Adding Entities to an Aggregate,”](#) on page 4-9).

By default, aggregates are created in a disaggregated state. However, you can change this behavior. For details, please see [“Configuring the Aggregate Creation State,”](#) on page 4-8.

4.2.1. Creating an Aggregate by Combining Existing Entities

When you create an aggregate by combining entities, you can specify the order of subordinates in the aggregate. This determines which subordinate is considered the aggregate leader and affects the assignment of echelon IDs. You cannot change the subordinate order after you create the aggregate.



When you create an aggregate entity, the members of the aggregate get new echelon IDs to reflect the new entity hierarchy.

To create an aggregate by combining existing entities:

1. Select the entities that you want to become part of an aggregate.
2. Choose **Entities** → **Aggregate As**. The Aggregate As dialog box opens ([Figure 4-3](#)).

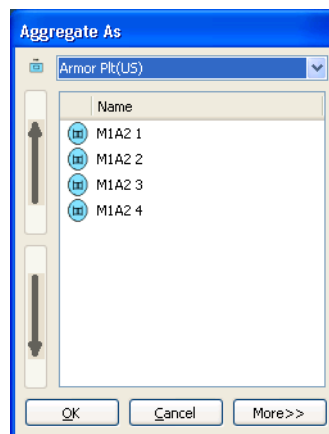


Figure 4-2. Aggregate As dialog box

3. Select an aggregate type from the list.



The Convoy aggregate can only be assigned convoy tasks. Its only purpose is to allow you to quickly aggregate miscellaneous ground vehicles into a convoy. You cannot aggregate or disaggregate a convoy aggregate.

4. Optionally, customize the entity type enumeration for the aggregate, as follows:
 - a. Click More. The dialog box expands to show the entity type enumeration for the aggregate type selected.

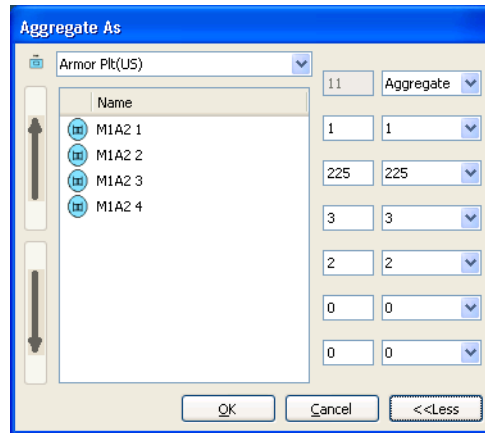


Figure 4-3. Aggregate As dialog box

- b. Edit the enumeration by typing values in the boxes in the left column, or selecting values from the lists in the right column.

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If an edit to the enumeration results in an entity type that does not match the aggregate type selected in the list, the list entry does not change. However, the aggregate will be created with the entity type specified by the custom enumeration.

5. Optionally, change the order of subordinates, as follows:
 - a. Select the subordinate whose order you want to change.
 - b. Click the up or down arrow to move it to a new position in the list of subordinates.
6. Click OK.

By default, the aggregate is created in a disaggregated, collapsed format. The icons for individual members are hidden. You can change the default aggregation state. For details, please see [“Configuring the Aggregate Creation State,”](#) on page 4-8.

4.2.2. Creating a Preconfigured Aggregate

VR-Forces includes preconfigured aggregates at several hierarchical levels. You can configure these entities and add additional aggregates in the Entity Editor. (For details, please see Section 5.5, “[Editing Aggregates](#)”, in *VR-Forces Configuration Guide*.)

The abbreviations in the aggregate names have the following meanings:

- ♦ ADA. Air defense artillery
- ♦ COLT. Combat observation lasing team
- ♦ CSS. Combat service support
- ♦ FA. Field artillery
- ♦ MI. Mechanize infantry.

To create a preconfigured aggregate:

1. Choose **Create** → **Aggregate** → *ForceType* → *aggregate*, where *ForceType* is Friendly or Opposing, and *aggregate* is one of the options on the sub-menu. The Create Object tab is added to the window.
2. Click on the terrain where you want to create the aggregate or click the Create Object tab to open the Create Object panel and specify the location in the Create Object panel.



You can add additional preconfigured aggregates to the Create menu the same way you would add other entities to it. For details, please see Section 7.5.1, “[Adding an Aggregate to the Object Parameters Database](#)” in *VR-Forces Configuration Guide*.

4.2.3. Configuring the Aggregate Creation State

To configure the aggregation state used when aggregates are created:

1. Choose **Settings** → **Display**. The Display Settings dialog box opens.
2. Select the Aggregate Display Settings page (Figure 4-4).

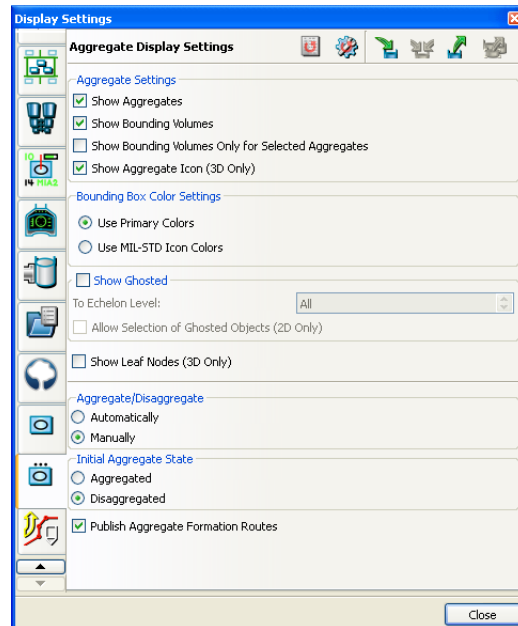


Figure 4-4. Aggregate Display Settings page

3. In the Initial Aggregate State group box, select the creation option that you want.
4. Click OK.

4.3. Selecting an Aggregate

- To select an aggregate, select its icon on the terrain, or select it in one of the views on the Objects List Panel.

4.4. Adding Entities to an Aggregate

- To add an entity to an aggregate, in the Echelon View, select the entity you want to add and drag it onto the aggregate as illustrated in [Figure 4-5](#).



You can add entities to an aggregate only if it is in the disaggregated state.

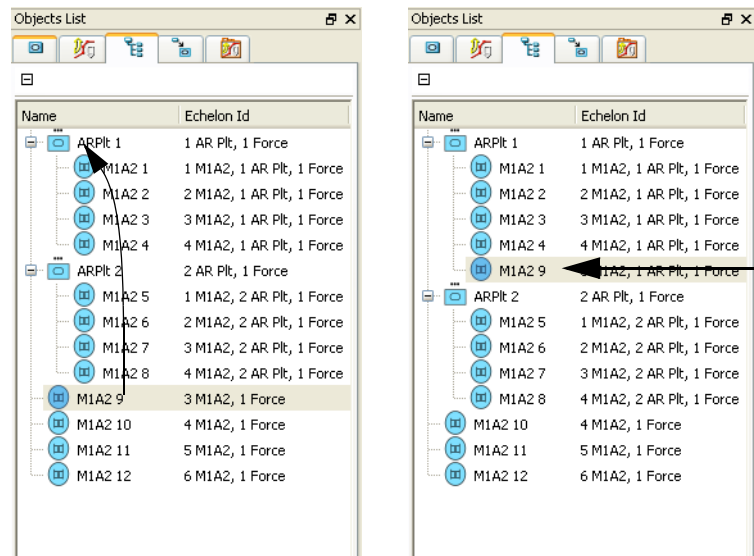


Figure 4-5. Adding an entity to an aggregate

4.5. Removing an Entity from an Aggregate

- To remove an entity from an aggregate, in the Echelon View, drag the entity from the aggregate to the force level in the window, as illustrated in [Figure 4-6](#), or into another aggregate.



You can remove entities from an aggregate only if it is in the disaggregated state.

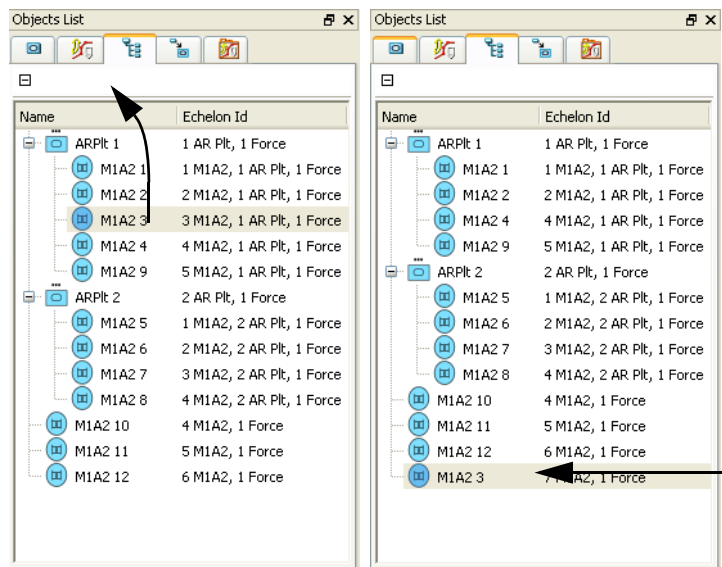


Figure 4-6. Removing an entity from an aggregate

4.6. Changing the Aggregation State of an Aggregate Entity

You can aggregate and disaggregate aggregates manually and automatically.



The Convoy aggregate does not support aggregation and disaggregation.

4.6.1. Aggregating and Disaggregating Entities Manually

To aggregate a disaggregated entity:

1. Select the aggregate.
2. Choose **Entities** → **Aggregate**.



You can also change an aggregate's state with the Set Aggregate State set data request (which also means that you can change state from within a plan).

To disaggregate an aggregated entity:

1. Select the aggregate.
2. Choose **Entities** → **Disaggregate**.

4.6.2. Configuring Automatic Aggregation and Disaggregation

When automatic aggregation and disaggregation is enabled, aggregated entities automatically disaggregate when they enter a disaggregation area or when they encounter opposing forces.

To configure automatic aggregation and disaggregation:

1. Choose **Settings** → **Display**. The Display Settings dialog box opens.
2. Select the Aggregate Display Settings page ([Figure 4-4](#)).
3. In the Aggregate/Disaggregate group box, select Automatically or Manually.
4. Click OK.

4.6.3. Using Disaggregation Areas

When an aggregated entity that has automatic aggregation and disaggregation enabled enters a disaggregation area, it disaggregates. When it leaves the area, it aggregates again. A disaggregation area is a tactical graphic. You create one just like any other area, as described in Chapter 2, [Creating and Placing Objects](#). The menu path for disaggregation areas is **Create** → **Disaggregation Area**.

4.7. Writing Plans for Aggregates

- To write a plan for an aggregate, follow the procedures for writing a plan for an entity in Chapter 8, [Writing Plans](#).

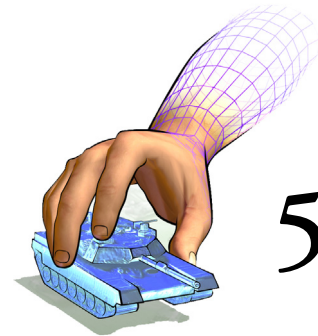
4.8. Deleting an Aggregate



If you delete an aggregate, all its member entities get deleted.

To delete an aggregate:

1. Select the aggregate.
2. Choose **Entities** → **Delete**.



Overlays and Tactical Graphics

This chapter explains how to create and edit overlays and tactical graphics.

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5.1. Introduction

Tactical graphics, also called control objects, define locations and areas on the terrain. Entities are aware of tactical graphics and can interact with them. For example, an entity can follow a route, move to a point, or avoid an obstacle. VR-Forces can test to determine if an entity is in an area or to either side of a phase line.

All tactical graphics are placed on overlays. By default, they are placed on the Default Overlay. You can create additional overlays and assign tactical graphics to them.

For conceptual information about tactical graphics, please see Section 3.7, “[Tactical Graphics](#)”, in *VR-Forces Users Guide*.

5.1.1. Naming Tactical Graphics

The names you assign to graphics must be unique among all objects. Names are case sensitive, for example you can create three points called Waypoint Alpha, waypoint alpha, and Waypoint alpha, but you cannot create an area called Area 1 and a disaggregation area called Area 1. Object names can be up to 255 characters long.



Some character sets require multiple ASCII characters to represent a displayed character. If you use one of these character sets, the maximum length of object names in visible characters may vary.

5.1.2. Draw Mode

When you create a graphical object, the cursor changes to draw mode. In draw mode, the cursor displays the waypoint symbol when you create a point and a vertex symbol when you create any type of line or area. [Figure 5-1](#) illustrates draw mode cursors.

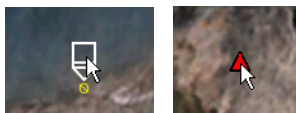


Figure 5-1. Cursors in draw mode

5.2. Creating and Editing Overlays

Overlays allow you to add graphic objects to the VR-Forces window as if you were adding clear plastic overlays to a physical map and drawing on them. They provide a convenient way to organize and manage the tactical graphics in a simulation. You can add any number of overlays. You can rename them. You can enable or disable editing of the objects they contain.

When you create a tactical graphic, if you do not explicitly assign it to an overlay, it gets placed on the Default overlay. If the Default overlay does not exist, it gets created.

5.2.1. Creating an Overlay

To create an overlay:

1. On the Objects List Panel, select the Overlays tab ([Figure 5-2](#)).

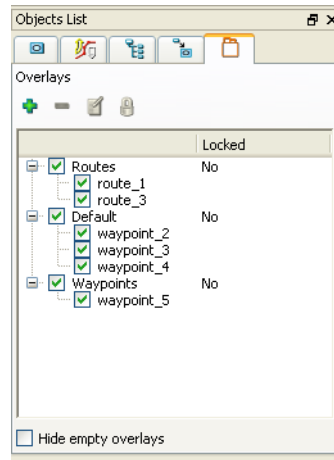


Figure 5-2. Overlays tab

2. Click the Add Overlay icon (+).
3. Optionally, change the name as described in [“Changing an Overlay’s Name,”](#) on page 5-4.

5.2.2. Selecting Overlays

- To select an overlay, click its name on the Overlays tab.

5.2.3. Locking an Overlay

When an overlay is locked, you cannot edit the objects on it. You can still add and delete objects.

To lock or unlock an overlay:

1. On the Objects List Panel, select the Overlays tab.
2. Select the overlay you want to lock or unlock.
3. Click the Lock/Unlock icon (🔒), or double-click the entry in the Locked column. It will toggle between Yes and No.

5.2.4. Changing an Overlay's Name

To change an overlay's name:

1. On the Objects List Panel, select the Overlays tab.
2. Click the Rename icon () or double-click the overlay whose name you want to change. The name becomes editable.
3. Type a new name.
4. Press **Enter**.

5.2.5. Deleting an Overlay

To delete an overlay:

1. On the Objects List Panel, select the Overlays tab.
2. Select the overlay you want to delete.



When you delete an overlay, all of the tactical graphics on it are also deleted.

3. Click the Delete icon () or press the **Delete** key.

5.3. Creating Tactical Graphics

The generic procedures for creating tactical graphics are described in Chapter 2, [Creating and Placing Objects](#). This section provides additional details about tactical graphic creation and placement.

5.3.1. Assigning Tactical Graphics to an Overlay

By default, when you create a tactical graphic, it gets assigned to whichever overlay is selected on the Overlay tab. If no overlay exists, the Default overlay is created and the graphic is assigned to it. You can assign a tactical graphic to a different overlay when you create it or edit it. To assign a tactical graphic to an overlay when you create it, set this property as described in [“Specifying an Object's Properties Before You Create It \(Click to Locate\)”](#) on page 2-8. To move a tactical graphic to a different overlay, follow the procedure in [“Moving a Tactical Graphic to a Different Overlay,”](#) on page 5-5.

5.3.2. Moving a Tactical Graphic to a Different Overlay

To move a tactical graphic to a different overlay:

1. Select the object you want to move.
2. Choose **Entities** → **Edit**. The Edit Object dialog box opens.
3. If Attach Object to Mouse is selected, clear the check box.
4. In the Overlay drop-down list, select the overlay that you want the object to move to.
5. Click Update.

5.3.3. Creating Routes for Aircraft

When you create a route for a fixed-wing entity, remember that as an aircraft flies between the vertices of a route, it starts at the altitude of the first vertex and immediately rises or falls to the altitude of the next vertex as shown in the trajectory in (Figure 5-3). (It does not change altitude smoothly between the vertices.) If a terrain feature in-between the two vertices is higher than the trajectory followed by the aircraft, the aircraft will fly into the terrain, even though a line between the two vertices would not pass through the terrain. There is no terrain following built into the route following process for fixed-wing entities.

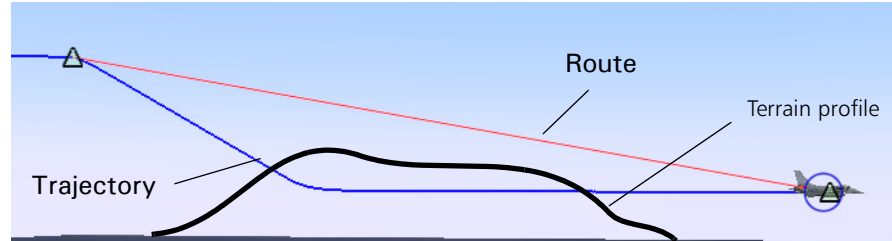


Figure 5-3. Fixed-wing trajectory between vertices

This caution applies to rotary-wing entities if there are abrupt changes in elevation in the terrain. Rotary-wing entities can follow the terrain, but they only look down, not ahead, so abrupt changes in terrain could cause a crash.

5.4. Editing Tactical Graphics

You can edit a tactical graphic's name and the location of its vertices. You can edit vertices dynamically or in the Edit Object dialog box.

You can add and remove vertices in routes and areas.

5.4.1. Adding a Vertex

You can add vertices to a route or area directly on the terrain or in the Edit Object dialog box.

To add a vertex to an object dynamically:

1. Right-click the vertex next to which you want to add a new vertex. A menu is displayed.
2. Choose **Add Point After** or **Add Point Before**. A point is added midway between the selected vertex and the next or previous vertex, based on the command you chose.
3. Optionally, edit the new point as described in Section 5.4.2, “Editing a Vertex”.

To add a vertex in the Edit Object dialog box:

1. Select the object you want to edit.
2. Choose **Entities** → **Edit**. The Edit Object dialog box opens (Figure 5-4).

	X (m)	Y (m)	Altitude
1	1783.1689	1079.5560	178.572
2	1824.6699	993.4797	183.634
3	1906.1350	955.0529	168.527
4	2024.4897	935.0709	140.966
5	2075.2132	1001.1651	135.020

Figure 5-4. Edit Route dialog box

3. If Attach Object to Mouse is selected, clear the check box.
4. In the list of vertices, select the vertex after which you want to add the new vertex.

5. Click the Add icon (✚). A vertex is added midway between the selected vertex and the next vertex. If you selected the last vertex, a new vertex is added to the end of the route.
6. Optionally, edit the new point as described in Section 5.4.2, “Editing a Vertex”.
7. Click Update.

5.4.2. Editing a Vertex

You can edit a vertex dynamically or in the Edit Object dialog box.

To edit a vertex dynamically:

1. Double-click the vertex.
2. Move the mouse to change the vertex's location.
3. Use **Alt**+mouse wheel or **Alt**+left mouse button+drag to change the altitude.
4. Click to place the vertex.

To edit a vertex in the Edit Object dialog box:

1. Select the object you want to edit.
2. Choose **Entities** → **Edit**. The Edit Object dialog box opens.
3. If Attach Object to Mouse is selected, clear the check box.
4. If you are editing a waypoint, click on the terrain to specify a new location or edit the X, Y coordinates and altitude in the Edit Waypoint dialog box.

If you are editing a phase line, route, or area, you can:

- a. Double-click the coordinate value you want to change to make it editable.
- b. Type a new value and press Enter or click someplace outside of the value.

Alternatively, you can click on the map to change the X, Y coordinates of the selected vertex. To set the altitude, you must edit the value by hand.

5. Click Update.

5.4.3. Deleting a Vertex

You can delete vertices directly or in the Edit Object dialog box.

To delete a vertex directly:

1. Right-click the vertex you want to delete. A menu is displayed.
2. Choose **Delete Point**. The point is deleted. (There is no confirmation prompt.)

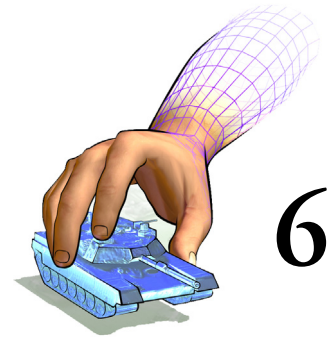
To delete a vertex in the Edit Object dialog box:

1. Select the object you want to edit.
2. Choose **Entities** → **Edit**. The Edit Object dialog box opens.
3. If Attach Object to Mouse is selected, clear the check box.
4. In the list of vertices, select the vertex you want to delete.
5. Click the Delete icon ().
6. Click Update.

5.5. Deleting Tactical Graphics

To delete a graphical object:

1. Select the object you want to delete.
2. Choose **Entities** → **Delete**, or press the **Delete** key.



Assigning Tasks

This chapter explains how to assign tasks to entities.

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6.1. Assigning Tasks to Entities

You can assign tasks to an entity as part of its plan, as part of a global plan, and independently of any plan. For conceptual information about tasks, please see Section 3.8, “Tasks”, in *VR-Forces Users Guide*. For information about how to add a task to a plan, please see “Adding an Entity Task or Set Data Request to a Plan,” on page 8-17. For the procedures for assigning tasks, please see “Task Procedures,” on page 6-15.

You cannot assign tasks to non-VR-Forces entities. However, you can use a remote entity as a parameter in a task, for example, following a remote entity, or targeting a remote entity. For more information, please see “Using Non-VR-Forces Entities in Plans,” on page 8-32.

6.1.1. Concurrent Task Execution

Some tasks can execute at the same time. Some are mutually exclusive. If you assign an entity a task that is mutually exclusive with its current task, the current task is abandoned. If you assign a task that is not mutually exclusive with the current task, an entity executes the new task and then continues with the previous task.

All movement tasks are mutually exclusive. Entities can execute the various Send tasks while they are executing movement tasks. For information about how to configure mutually exclusive tasks, please see Section 8.8, “Configuring Task Execution Rules”, in *VR-Forces Configuration Guide*.

6.1.2. Escaping the Task Assignment Process

You can escape the task assignment process at any point before you complete it.

- To escape the task assignment process, in the task dialog box, click Cancel.

6.1.3. Specifying Parameters for Tasks

VR-Forces lets you specify task parameters in dialog boxes or by selecting them on the terrain. Many tasks require you to select an object or entity.

If you select the appropriate object, the selection is reflected in the task dialog box.

If you prefer, you can specify all parameters in the task dialog box. Depending on the zoom level of the terrain and the number of entities and tactical graphics you have created, it may be easier to select an object from a list than to select it from a densely packed group of icons.

6.1.4. Determining the Current Task

The Entity Information dialog box for an entity lists its current task on the Entity State page. If an entity is executing a task as part of its plan, you can also see which task it is executing by opening its Plan window.

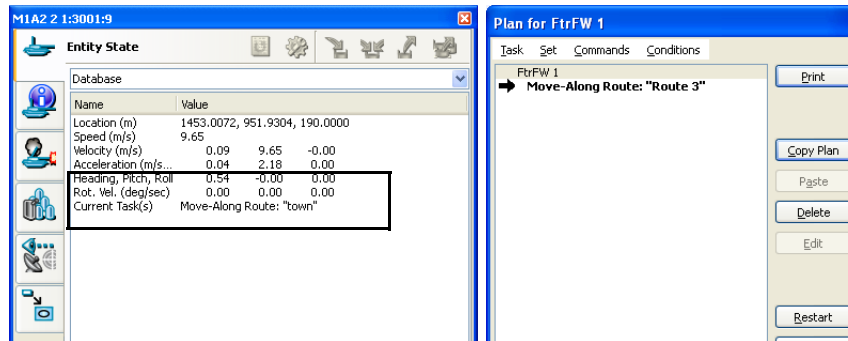


Figure 6-1. Display of entity task status

6.1.5. Filtering the Object Selection Lists

If a task requires you to select objects, you can filter the object selection list to make it easier to find the particular objects you need to select (Figure 6-2). If you are selecting entities, for example in a Follow Entity task, you can display all entities, individual entities only, or aggregate entities only. Within the latter two groups, you can display friendly or opposing entities. In a Move To task, you can filter for waypoints, friendly entities, or opposing entities.

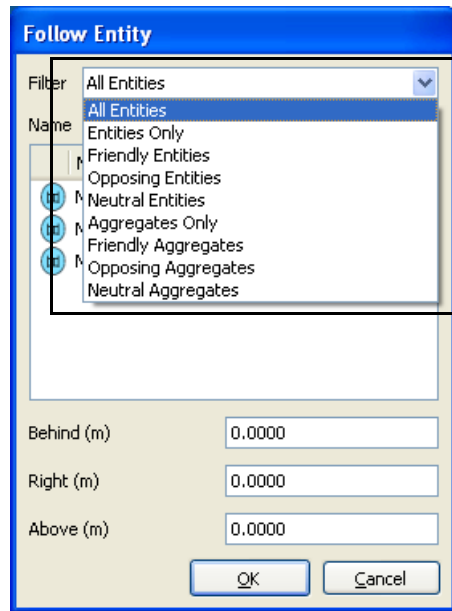


Figure 6-2. Entity filter list

- To filter an entity list, in a task or set data request dialog box, choose the filter type from the list.

6.1.6. Skipping a Task

You can instruct an entity to skip the task it is executing. If the entity is executing a plan, it moves to the next task in its plan. If there are no further tasks, the entity waits for further orders.

- To order an entity to skip a task, choose **Entities** → **Skip Task**.



Skip Task does not apply to members of an aggregate that are executing tasks assigned to them by the aggregate leader.

6.2. Assigning Tasks to Aggregates

- To assign a task to an aggregate, select the aggregate, then assign it a task as you would any individual entity.

6.2.1. Convoy Tasks

VR-Forces has two tasks for moving in convoys – Convoy Along and Convoy To. These tasks can only be assigned to aggregate entities made up of ground vehicles. When an aggregate receives a convoy task, it organizes itself into a column based on the echelon IDs. Then it executes the task.

Once the task begins, the members of the aggregate try to maintain a consistent distance apart from each other. You can configure this distance by editing the Ground Convoy Movement system in the OPD Editor. The distance is specified by the **separation-distance** parameter. You can also specify an amount by which the separation distance can vary using the **separation-tolerance** parameter.



If VR-Forces can determine that a convoy task is not appropriate for a given aggregate, for example a rotary wing aggregate, the convoy tasks will not be available on the Task menu. However, in other cases, such as mixed aggregates or if you aggregate disparate entities as Ground Aggregate, it is up to you to know whether or not an aggregate consists only of ground vehicles or contains platforms that do not support convoy tasks.

6.2.2. Independently Tasking Aggregate Members

Members of a disaggregated aggregate can have individual plans or be assigned tasks independently of the aggregate. If a member of an aggregate unit is independently tasked, when it completes its task it automatically becomes tasked by its superior. You do not need to give it a Set Tasked by Superior set data request. You can override this behavior by setting an object's **tasked-by-superior-upon-task-complete** parameter in the object parameter database to False.

When an entity becomes tasked by its superior, it does not execute the task that the aggregate is currently executing. It receives the next task that is sent out by the aggregate.



When a disaggregated aggregate changes to the aggregated state, the individual subordinates cease to exist. Therefore, if a subordinate is executing an independent task, when the aggregate changes state, the task activity ends immediately.

6.3. Path Planning for Movement Tasks

When you give a ground entity (vehicle, lifeform, or aggregate) a Move To Waypoint, Move to Location, or Move Along task, you can specify that it move directly to the destination or that it use roads. When a vehicle uses roads, it calculates a path to the destination and if there are any road vector features close to the calculated path, it drives along the roads for as long as possible, rather than going directly across the terrain to the destination. VR-Forces supports two approaches to using roads, path planning and road driving.

6.3.1. Road Driving

When a ground vehicle moves along roads, the default movement strategy is road driving. When a vehicle uses road driving:

- ♦ It moves as quickly as it can to the road, without paying attention to soil types or the slope of the terrain.
- ♦ Once it reaches the road, it clamps to the road and does not deviate from it.
- ♦ It goes around corners more accurately than when road driving is disabled.
- ♦ It ignores any obstacles that are near to the road and which would ordinarily trigger obstacle avoidance. The vehicle only responds to obstacles that block the road.
- ♦ If a vehicle is blocking its progress, and there is an adjacent lane in the road that is clear, the entity passes the blocking vehicle.

In the Move Along Route task, you can specify that VR-Forces treat the route as a road. The entity would then use the road driving system to follow the road. To explicitly mandate road driving for an entity, set its movement strategy to Yes. For information about setting movement strategy, please see [“Set Movement Strategy,”](#) on page 7-19.

6.3.2. Path Planning

If you disable the road following movement strategy, when you specify that an entity use roads in a movement task, it uses the path planning strategy.

When an entity plans a path, it takes into account terrain features and roads. In the object parameter database, you can specify vector feature types that are to be considered impassable. By default, most ground entities treat all features in the MAK Roads group as roads, and all features in the MAK Water group as impassable. For more information about vector feature types, please see Appendix A, *The MÄK Specification Model*, in *MÄK Terrain Database Tool Users Guide*.

VR-Forces considers the soil type along each path section, as well as the average slope of the terrain, and compares these values to the capabilities of the vehicle to determine the cost of moving along the path.

Depending on the complexity of the terrain, the length of the path, and the available processor power of the computer being used, it may take anywhere from under a second to multiple minutes for an entity to calculate its path. The path planning is done in a separate thread from the main simulation, so it will not affect the running of the simulation. While an entity is calculating its path, it does not move.



Because multithreading is used in this component, any VR-Forces scenario that makes use of path planning cannot run in repeatable mode.

After VR-Forces plans a path, it creates a temporary route for the entity to follow. You can edit the route and the entity will move along the modified route. Once the route is published, the entity moves along it as it would along any other route. When the entity reaches its destination, the route is removed.

In the object parameter database that ships with VR-Forces, all ground vehicles have a path movement controller.

6.4. Fixed-Wing Entity Tasks and Behaviors

This section describes the behaviors of fixed-wing entities supplied with VR-Forces and the issues you should keep in mind when assigning tasks and set data requests.

6.4.1. Placement of Newly Created Fixed-Wing Entities

When you create a fixed-wing entity, it is placed on the ground. If you want a fixed-wing entity to start a scenario in the air, you must set its altitude at the beginning of the scenario. It will loiter at the specified altitude.

6.4.2. Fixed-Wing Entity Movement on the Ground and in the Air

Fixed-wing aircraft support takeoff and landing. Since they can move on the ground and in the air, you need to understand their behavior in these different environments. [Table 6-1](#) and [Table 6-2](#) describe how fixed-wing entities respond to Move To, Move Along Route, and Patrol Route tasks depending on their current location. The rest of this section provides additional details about take-off and landing.

Table 6-1: Fixed-wing entity Move To behavior

If entity is on/in the:	and waypoint is on/in the:	the entity:
Ground	Ground	taxis to point.
Ground	Air	takes off towards the point.
Air	Air	flies to point.
Air	Ground	crashes.

Table 6-2: Fixed-wing entity route-following behavior

If entity is on/in the:	and next vertex is on/in the:	the entity:
Ground	Ground	taxis to vertex.
Ground	Air	takes off toward the vertex.
Air	Air	flies to the vertex.
Air	Ground	tries to land at the vertex.

Fixed-wing entities do not support terrain-following. Therefore, when you task a fixed-wing entity to move to a point or follow a route, you must be certain that there are no points in the terrain that are higher than the altitude of the entity's flight path, or the entity will crash. For example, if you assign a fixed-wing entity to follow a route whose vertices are set at 3000 meters above sea level, if the terrain rises above 3000 meters at some point in between two vertices of the route, the entity will crash into the terrain at that point ([Figure 6-1](#)).

Fixed-Wing Movement Between Vertices

If two vertices in a route are not at the same altitude, a fixed-wing entity does not fly from the first vertex to the second in a smooth gradient. As soon as it passes the first vertex, it immediately descends to the altitude of the next vertex and then continues to fly towards it at that altitude. Therefore, it is possible that you could create a route that does not intersect the terrain, but an entity flying along that route could crash because a location in the terrain exceeds the altitude of a destination point, as illustrated in (Figure 6-3).

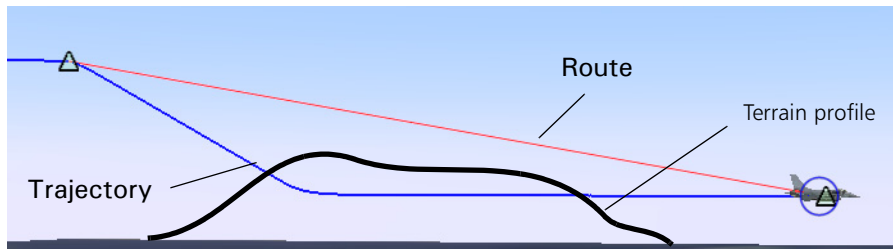


Figure 6-3. Fixed-wing trajectory between vertices

6.4.3. How Fixed-Wing Entities Take Off

You can have fixed-wing aircraft take off using the Fixed Wing Takeoff task (for details, please see “[Fixed Wing Takeoff](#),” on page 6-23) or by using innate behavior. This section describes take-off using innate behavior.

Fixed-wing entities take off by moving to a waypoint that is above ground level or by following a route that has a vertex above ground level.

When you task a fixed-wing entity to move to a waypoint that is above ground level, the entity orients itself directly towards that point and accelerates in the direction of the point. When it reaches its minimum lift speed, it takes off and rises to the altitude of the point it is moving to. You can control the distance required to take off by setting the **max-thrust** parameter.

When a fixed-wing entity takes off, it does not take into account the soil type or terrain, except that if the slope of the terrain along which the entity must move to take off is greater than the **max-slope** parameter, the entity halts.

Fixed-wing entities do not know anything about runways that may be part of a terrain database. When you create a waypoint towards which an entity will take off, or create a route along which an entity will take off, you are responsible for ensuring that the entity is properly oriented towards the runway.

If an entity takes off as part of route following, you can define a runway with two points on the ground. If an entity detects that the point in the route after the one it is moving towards is in the air, it uses the current point as the take-off direction, but takes off as soon as possible and flies to the point in the air. [Figure 6-4](#) illustrates this behavior.

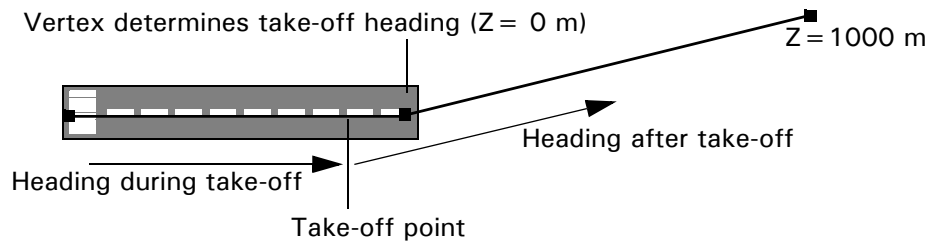


Figure 6-4. Defining a runway for take-off

6.4.4. How Fixed-Wing Entities Land

You can have aircraft land using the Fixed Wing Land task (please see “[Fixed-Wing Land](#),” on page 6-23), or as described in this section. The underlying behavior of the Fixed Wing Land task is the same as in this section. Using the Fixed Wing Land task automates the process of setting up the approach route.

A fixed-wing entity can land only in the context of following or patrolling a route. When a fixed-wing entity follows a route and determines that the next vertex in the route is on the ground, it decelerates as it reduces altitude towards that vertex. If it does not have enough distance from the previous vertex to decelerate sufficiently, it may crash. To ensure adequate deceleration, you may want to create a trigger that sets the entity’s speed when it approaches the runway.



Any time an entity is within 10 meters of the terrain and it is moving within 10 percent of its minimum lift speed, it will try to land.

To orient an entity for landing, you may have to create several vertices prior to the runway to get the entity properly lined up. [Figure 6-4](#) shows two different routes ending at an airport (the routes have been edited to improve visibility). The first route has vertices that line up the entity with the runway. The second route curves in towards the runway, so the entity does not approach the runway in a straight line. Therefore, as it reaches the landing point, it is not lined up with the runway and it lands on the taxiway.



Entity lands on runway



Entity lands to left of runway

Figure 6-5. Landing fixed-wing entities

6.4.5. Specifying and Maintaining Altitude for Fixed-Wing Entities

The Set Altitude set data request moves an entity immediately to the specified altitude. If you want an entity to fly to a new altitude, assign the entity a Move to Altitude task. It spirals to the specified altitude at the same X, Y coordinates that it had when it received the task.

6.5. Rotary-Wing Entity Tasks and Behaviors

This section describes the behaviors of rotary-wing entities supplied with VR-Forces and the issues you should keep in mind when assigning tasks and set data requests.

Rotary-wing entities get created on the ground unless you specify an altitude at creation. (For details about specifying an altitude when you create an air platform, please see [“Specifying an Object’s Altitude,”](#) on page 2-10.)

If a rotary-wing entity is airborne and it is not assigned a task, it hovers at the specified location and altitude. When it completes a task, it hovers in the location where it completed the task.

The **terrain-check** parameter determines how a rotary-wing entity interacts with the terrain. If **terrain-check** is False, a rotary-wing entity ignores the terrain. It could appear to fly below ground. However, when **terrain-check** is set to True, VR-Forces does not have to check ground points, so performance may improve.

When **terrain-check** is True, rotary-wing entities interact with the terrain. If a rotary-wing entity approaches a ground point at three meters per second or less, it lands. If it approaches the ground at a greater speed, it crashes.

Helicopters have a basic terrain avoidance algorithm that helps prevent crashing if they are sent to waypoints or follow routes that do not have an altitude. The terrain avoidance logic maintains a distance above the ground; it does not look ahead. So, a helicopter could crash if the terrain rises suddenly ([Figure 6-6](#)).

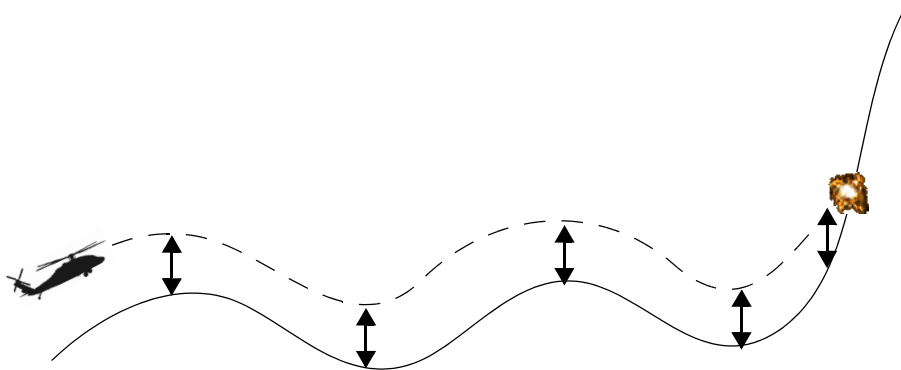


Figure 6-6. Helicopter terrain avoidance

6.5.1. Controlling Rotary-Wing Orientation

A rotary-wing entity can move laterally (sideways) without changing its orientation. In other words, it does not have to face in the direction it is moving. Rotary-wing entity movement controllers have two parameters that configure the speed at which a rotary-wing entity can move laterally. Rotary-wing entities rotate to try to align themselves with their velocity vector under the following circumstances:

- ♦ If the current speed is greater than the speed specified by **vel-to-align-actual**.
- ♦ If the speed of the entity is not greater than **vel-to-align-actual**, but the desired speed of the entity (the velocity it is attempting to achieve as a result of position or velocity commands) is greater than **vel-to-align-desired**.

If you do not want a rotary-wing entity to align itself with its direction of travel, set **vel-to-align-actual** and **vel-to-align-desired** to speeds that are greater than the speed at which you expect the entity to travel. You can set these parameters in the OPD Editor.

6.6. Task Procedures

The following sections describe the procedures for the tasks supplied with VR-Forces. If your installation uses the VR-Forces API to add additional tasks, consult with your software engineers for local procedural information. Please see [“Fixed-Wing Entity Tasks and Behaviors,”](#) on page 6-8 and [“Rotary-Wing Entity Tasks and Behaviors,”](#) on page 6-14, for additional information about assigning tasks to these entity types.

The instructions in this section for creating tasks direct you to use options on the main menu. However, all the options available on the main menu are also available in plans and on right-click menus.

6.6.1. Convoy Along

The Convoy Along task commands an aggregate to move along a route in a convoy. When the task starts, the lead entity moves far enough along the route for the rest of the aggregate to create a column that ends approximately at the beginning of the route. Then the aggregate begins moving along the route.



The Convoy Along task is valid only for ground-vehicle aggregates.

For more details about convoys, please see “[Convoy Tasks](#),” on page 6-6.

To assign a Convoy Along task:

1. Select the aggregate that you want to send in a convoy.
2. Choose **Task** → **Convoy Along**. The Convoy Along dialog box opens.
3. Specify the route to convoy along.
4. Click OK.

6.6.2. Convoy To

The Convoy To task commands an aggregate to move to a waypoint in a convoy. If you specify use of roads, VR-Forces uses the information in the road network to plan the convoy’s movement. If you do not specify use of roads, the convoy moves directly across the terrain as an individual entity would move in a Move To task.



The Convoy To task is valid only for ground-vehicle aggregates.

For more details about convoys, please see “[Convoy Tasks](#),” on page 6-6.

To assign a Convoy To task:

1. Select the aggregate that you want to send in a convoy.
2. Choose **Task** → **Convoy To**. The Convoy To dialog box opens.
3. Specify the waypoint to convoy to.
4. Specify whether or not to use roads.



When you specify use of roads, VR-Forces looks for roads over a fairly wide area and if one is found, will try to use them even if this results in an indirect approach to the waypoint. If there are no roads close to the route you would expect the aggregate to take to reach the waypoint, do not select this option.

5. Click OK.

6.6.3. Disembark and Disembark All

The Disembark task causes an entity to move to the parent entity's egress (exit) point and disembark. If the selected entity is an aggregate (disaggregated), the disembark task is given to all embarked subordinates. The task is considered complete when all subordinates are disembarked. To disembark entities immediately, that is, without using a task, please see [“Embarking and Disembarking Entities,”](#) on page 3-5.

i

- ♦ When an entity disembarks, it simply goes to the disembarkation location. If you plan to disembark several entities from the same parent by giving them disembark tasks, you are responsible for making sure that each entity moves from the disembarkation point before the next entity disembarks.
 - ♦ Aggregate entities in the aggregated state cannot embark or disembark. If a disaggregated entity is embarked, you cannot aggregate it either manually, or as a result of automated aggregation conditions.
-

To disembark an entity:

1. Select the entity you want to disembark.
2. Choose **Task** → **Disembark**, or click the Disembark icon () on the Tasks toolbar.

Disembarking All Entities from a Parent Entity

The Disembark All task is given to a parent entity. It gives a Disembark task to all embarked entities except aggregates. When you issue a Disembark All task, VR-Forces tries to disembark the entities sequentially and have them move to sufficiently dispersed locations to avoid collision problems.

To disembark all entities from a parent entity:

1. Select the parent entity.
2. Choose **Task** → **Disembark All**.

6.6.4. DI-Guy Animation

VR-Forces can specify the movements and appearance of DI-Guy models used in the Stealth observer mode and in 3D visualization programs such as VR-Vantage Stealth. The DI-Guy Animation task directs the 3D model to engage in a one-time or repeated series of motions. VR-Forces does not simulate the actions that the 3D model performs; it just adjusts the location and orientation of the VR-Forces entity to synchronize it with the 3D model's animated behavior. To change a 3D model's appearance, use the DI-Guy Appearance set data request. For details, please see [“Set DI-Guy Appearance,”](#) on page 7-10.



The DI-Guy Animation task applies only to lifeform entities.

To specify a DI-Guy animation:

1. Select the lifeform entity whose behavior you want to animate.
2. Choose **Task** → **DI-Guy Animation**. The DI-Guy Animation dialog box opens ([Figure 6-7](#)).

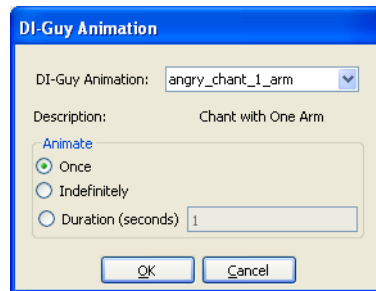


Figure 6-7. DI-Guy Task Animation dialog box

3. In the Animation drop-down list, select an animation. Animation options can be unclear. The Animation Description is a friendlier description of what the animation is.



You can edit the animation description. Descriptions are in *./appData/settings/vrfSim/character_animations_table.mtl*.

4. In the Animate group box, specify the duration of the animation.
5. Click OK.

6.6.5. Embark

The Embark task causes an entity to move to the ingress (entry) point of the parent entity and embark on it. If the embarking entity is a aggregate, each available taskable subordinate is given an embark task. When all subordinates have embarked, the aggregate task is considered complete.



Aggregate entities in the aggregated state cannot embark or disembark.

The Embark task is valid only if the specified parent entity is configured to accept the entity that wants to embark on it. If you task an entity to embark on an entity that is not configured to receive it, for example, you task a DI to embark on an M1A2, the entity will not respond to the task. If you want to embark an entity on an entity that is not configured to receive it, you can use the immediate embarkation process. For details, please see [“Embarking and Disembarking Entities,”](#) on page 3-5.

[Table 6-3](#) lists the entities that support embarkation and the number and type of embarked entities they can hold. High fidelity entities (HF column) have polygonal models of the entity and embarkation slots defined in such a way that the embarking entities can smoothly embark on the host entity when viewed in the 3D view or VR-Vantage.

Table 6-3: Embarkation support

Entity	Can Carry	HF
M2A2 Bradley IFV	6 DI	
M113 Armored Utility Vehicle	11 DI	
M-939A2 5-Ton Truck	14 DI	x
MT-LB Multipurpose Armored Vehicle	11 DI	
BTR-80 Armored Personnel Carrier	11 DI	
BMP-2 AVF	7 DI	
C-130 Hercules	92 DI or 3 ground vehicles	
CH-46E Sea Knight	11 DI	
CH-53E Super Stallion	55 DI	
UH-60 Blackhawk	11 DI	
OH-58 Kiowa	6 DI	
Mi-2 Hoplite	11 DI	
LCAC Landing Craft Air Cushion	12 HMMWVs or 4 trucks or 1 M1A2 or 1 generic ground vehicle	x
LSD-49 Harpers Ferry	2 LCACs and 2 helicopters	x

Table 6-3: Embarkation support

Entity	Can Carry	HF
Guided Missile Destroyer	2 helicopters	
Aircraft Carrier	12 fighters or 9 fighters and 2 cargo planes. Three helicopters. 70 planes below deck.	x

The aircraft carrier can carry both fixed-wing and rotary-wing aircraft. After the deck positions are used, additional entities embarked are stored below deck, as in a low-fidelity model.



- If you are using HLA and want to use the embarkation feature, you must use RPR FOM 2, draft 17. In Windows, VR-Forces includes entries on the Simulation Connections Configuration dialog box that start VR-Forces using the correct FED file and FOM Mapper for RPR FOM 1.0, and RPR FOM 2, draft 17.
- If the embarkation spaces on the parent entity are full, VR-Forces sends a message to the back-end console and the entity does not try to embark.
- If you give multiple entities embark tasks for the same parent, you are responsible for spreading the tasks over time so that the entities do not all converge on the parent at the same time, which would result in problems due to collision avoidance.

To embark an entity:

1. Select the entity.
2. Choose **Task** → **Embark**, or click the Embark icon (🚢) on the Tasks toolbar. The Embark On dialog box opens.



Unlike the Embark On dialog box that opens when you choose **Entities** → **Embark**, the Embark On dialog box for the Embark task does not allow you to choose the embarkation point.

3. Select the parent entity (the entity to embark on) or type its name in the Name box.
4. Click OK.

6.6.6. Fire Cruise Missile

A cruise missile can fly directly to a target or follow a route.

To fire a cruise missile:

1. Select an entity that has cruise missile resources.
2. Choose **Task** → **Fire Cruise Missile**. The Fire Cruise Missile dialog box opens (Figure 6-8).

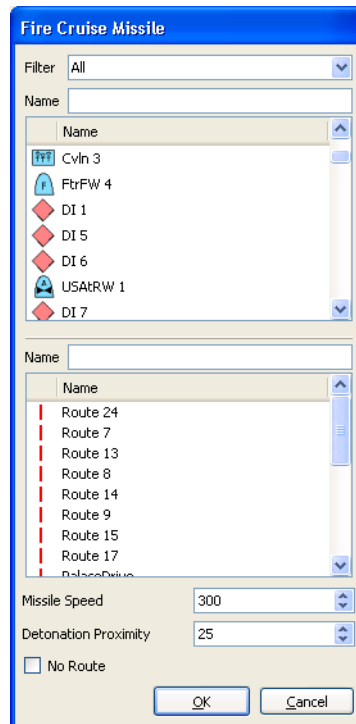


Figure 6-8. Fire Cruise Missile dialog box

3. Select the target from the list or on the terrain, or type its name in the Name box. Targets can be entities or points.
4. Select a route for the missile to follow or select No Route. If no route is selected, the missile flies directly to the target.
5. Specify the ordered speed for the missile.
6. Specify the detonation proximity for the warhead. It will detonate within this range of the selected target.
7. Click OK.

6.6.7. Fire for Effect Tasks

You can task artillery entities to fire for effect. The three options are:

- ♦ Fire-for-Effect on Entity
- ♦ Fire-for-Effect on Location, where location is a point in the terrain.
- ♦ Fire-for-Effect on Target, where a target is a waypoint.

To assign a Fire-for-Effect task:

1. Select the entity to which you want to assign the task. (It must be an artillery entity.)
2. Choose **Task** → **Fire-for-Effect on Entity** (or Location or Target). The appropriate dialog box opens.
3. Identify the target as follows:
 - For FFE Entity, select the target entity in the list, select it on the terrain, or type its name in the Name box.
 - For FFE Location, click a location on the terrain, or enter the coordinates.
 - For FFE Target, select a point from the list, or select it on the terrain.



For FFE Entity and FFE Target, you can filter the target list.

5. Specify the number of rounds.
6. Optionally, specify the height above the terrain at which rounds should detonate.
7. Click OK.



- ♦ The Fire-for-Effect tasks are only meaningful when assigned to artillery entities.
 - ♦ When you choose Fire-for-Effect on Entity, VR-Forces notes the location of the entity and fires at that spot. If the targeted entity moves, the artillery does not change the location at which it is firing.
 - ♦ Artillery entities have maximum and minimum ranges. However, these ranges are not indicated visually on the terrain. The back-end console window prints messages when you select targets that are outside of the entity's range.
-

6.6.8. Fixed-Wing Land

“[How Fixed-Wing Entities Take Off](#),” on page 6-11, describes how fixed-wing entities land and the steps to design a landing approach. The Fixed Wing Land task automates the process of landing a fixed-wing aircraft. However, you must still specify a route to serve as the runway.

When the task is invoked, VR-Forces defines an approach route for the plane to move along. The length of this route is either the distance the plane is above the ground (altitude in meters) or the length needed to slow the plane down to landing speed (whichever is greater). The route is created and the plane moves along the route, coming to landing speed. At the end of the approach route, the plane is tasked to move along the runway.



Although it is possible to land an entity on another entity, such as an aircraft carrier, if you want to embark an entity, you must use the Embark task, not a landing task.

To land a fixed-wing aircraft:

1. Select the entity.
2. Choose **Task** → **Fixed Wing Land**. The Fixed Wing Land dialog box opens.
3. In the Name box, type the name of the route you want it to land on, or select the route in the list or on the terrain.
4. Click OK.

6.6.9. Fixed Wing Takeoff

You can explicitly task a fixed-wing entity to take off. (For details about implicit take-off, please see “[How Fixed-Wing Entities Take Off](#),” on page 6-11.) In a Fixed Wing Takeoff task, the entity moves along the specified route, reaches takeoff speed (30% of minimum lift), and then moves to a point defined by the controller some distance up and away from the end of the route.

To assign a Fixed Wing Takeoff task:

1. Select the entity.
2. Choose **Task** → **Fixed Wing Takeoff**. The Fixed Wing Takeoff dialog box opens.
3. Select the route to take off on or type its name in the Name box.
4. Click OK.

6.6.10. Follow Entity

You can order an entity to follow another entity. You can specify a distance and offset between the entities. If you tell two or more entities to follow the same entity, make sure that you do not give them the same offset (please see [“Following Entities,”](#) on page 8-31).

An entity continues to follow its target entity until:

- ♦ The task is overridden
- ♦ The followed entity is destroyed.

If entity A is assigned to follow entity B, but it cannot find entity B, entity A continues to look for entity B until entity B becomes available, or until entity A is assigned another task.

The following entity tries to match the speed of the followed entity unless it has to hold back or catch up to accommodate changes in direction or terrain effects.

To order an entity to follow another entity:

1. Select the entity.
2. Choose **Task** → **Follow Entity**. The Follow Entity dialog box opens.
3. Optionally, filter the entity list.
4. In the Name box, type the name of the entity to follow, or select it from the list or on the terrain.
5. Optionally, type an offset (in meters) in the Behind, Right, and Above text boxes. If you want an entity to follow in front, to the left, or below, put a minus sign (-) in front of the value.
6. Click OK.

How Fixed-Wing Entities Follow Entities

A fixed-wing entity can follow an entity that is on the ground, or might be on the ground, for example if it is following a fixed-wing entity that lands. To ensure that the follower does not crash, make sure that it is following above the followed entity and that the distance above is high enough to account for changes in the terrain.

6.6.11. Intercept and Destroy

The Intercept and Destroy task tells an entity to move towards the target entity and engage it in any way that is appropriate.



Intercept and Destroy turns off collision avoidance for the tasked entity. Its primary purpose is to allow entities such as car bombs and suicide bombers to approach a target entity and detonate its munition. If you give this task to an entity that does not have any offensive capability, such as a truck, it will ram the target. However, since VR-Forces does not model the effects of two entities colliding, there will be no damage to either entity and the tasked entity may end up circling the target. Therefore, you should be careful about which entities you assign this task to or the results may not be what you expect.

To assign the Intercept and Destroy task:

1. Select the entity to which you want to assign the task.
2. Choose **Task** → **Intercept and Destroy**. The Intercept and Destroy dialog box opens.
3. Select the entity that is to be the target of the assault.
4. Optionally, specify a standoff distance. The entity will not go closer to the target than this distance.
5. Click OK.

6.6.12. Lase Target

The Lase Target task simulates aiming a laser beam at a target to guide a laser guided weapons. By default, entities with laser capability lase autonomously. Use this task if you want to lase a specific target. An entity can lase a target while it is executing a movement task.

To lase a target, an entity must have a Laser Designator system. By default, rotary-wing entities based on the generic attack helicopter platform and the DI Lasing entity can lase targets.

To lase a target:

1. Select the entity that will aim the laser.
2. Choose **Task** → **Lase Target**. The Lase Target dialog box opens.
3. Select the entity that you want to lase.
4. Click OK.

6.6.13. Launch Smoke

The Launch Smoke task causes an entity to create a smoke cloud. The cloud is created as an environmental object. It grows over time.

An entity can launch a smoke cloud towards a threat or in a specific direction. Smoke clouds affect sensors. They do not affect entity movement.



Smoke is simulated by the simulation engine, but is not displayed in the front-end. (Firing and detonation of the smoke munition is displayed if fire and detonation lines are enabled, but not the smoke itself.)

To launch a smoke cloud:

1. Select the entity that you want to launch smoke.
2. Choose **Task** → **Launch Smoke**. The Launch Smoke dialog box opens.
3. Select At Nearest Threat or Toward Compass Heading.
4. If you selected Toward Compass Heading, specify a compass heading, in degrees.
5. Click OK.

6.6.14. Move Along Route

By default, an entity moves along a route from its beginning point to its end point.



- ♦ If you edit a route while an entity is moving to the starting point of that route as part of a Move Along Route task, the entity will move to the nearest vertex, whether it is the starting point, or not.
 - ♦ When you task an air platform entity to follow a route, be sure to take into account the altitude of the route's vertices and the terrain the entity has to pass over to complete the task.
 - ♦ Aggregates do not generate subordinate routes until they reach the beginning of the route.
 - ♦ An aggregate starts moving along a route when the leading edge of its formation is at the first point of the route. It is considered finished when the leading edge reaches the last point of the route.
-

To direct an entity to move along a route:

1. Select the entity.
2. Choose **Task** → **Move Along Route**, or click the Move Along Route icon () on the Tasks toolbar. The Move Along Route dialog box opens.
3. In the Name box, type the name of the route you want the entity to follow, or select a route in the list or on the terrain.
4. To have the entity move from the end of the route to the beginning, select Reverse Direction.
5. To have the entity use the road driving movement strategy, select the Treat Route as Road check box. The route is treated as a two-lane bidirectional road.
6. Click OK.

6.6.15. Move Into Formation

You can order a disaggregated aggregate to move to a formation at a specified location. Moving to a formation is not the same as setting formation. Setting formation changes the formation instantly. Moving to a formation causes the members of the aggregate to simulate traveling through the terrain into the new formation.

For aggregated aggregates, Move Into Formation has the same effect as a Set Formation set data request.

To direct an aggregate to move to a formation:

1. Select the aggregate.
2. Choose **Task** → **Move Into Formation**. The Move Into Formation dialog box opens.
3. Select the desired formation from the list.
4. Specify the location at which the aggregate is to move into formation by entering X, Y, and Z values, or by clicking on the terrain.
5. If you specify the location by clicking and the task is for an air platform that is in the air, change the Z value to a height that will prevent the entity from crashing.
6. Specify the heading the aggregate is to assume at the target location.
7. Click OK.

6.6.16. Move To Altitude

You can order an air or subsurface entity to move to an altitude. When you assign this task, the entity moves to the new altitude at the same X, Y coordinates. Fixed-wing aircraft spiral to the new coordinates. Rotary-wing and subsurface entities rise or fall. Moving to an altitude is not the same as setting altitude. Setting altitude moves an entity instantaneously.



Fixed-wing entities that are on the ground cannot respond to a Move to Altitude task. If they are given this task, a message is printed to the object console and the task is ignored.

To send an entity to an altitude:

1. Select the entity.
2. Choose **Task** → **Move to Altitude**, or click the Move to Altitude icon () on the Tasks toolbar. The Move To Altitude dialog box opens.
3. Type the altitude, in meters, that you want the entity to move to. Use a negative number to submerge submarines.
4. Click OK.

6.6.17. Move To Location

You can order an entity to move to a location on the terrain. You can specify direct movement or the use of path planning. If you add Move to Location tasks to a plan, you have more options than when you give an independent task.

Moving to a location is not the same as setting location. Setting location moves an entity instantaneously. Moving to a location causes an entity to simulate traveling through the terrain.

To direct an entity to move to a location as an independent task:

1. Select the entity.
2. Choose **Task** → **Move to Location**, or click the Move to Location icon (📍) on the Tasks toolbar. The Move to Location dialog box opens.

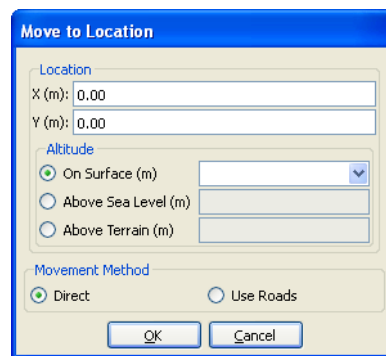


Figure 6-9. Move to Location dialog box for an independent task

3. Click on the terrain where you want the entity to move, or enter the coordinates of the location in the Move to Location dialog box.
4. Optionally, set the altitude, as described in [“Specifying an Object’s Altitude,”](#) on page 2-10.



If you specify the location by clicking and the task is for an air platform that is in the air, be sure to change the Z value to a height that will prevent the entity from crashing.

5. For ground entities only, in the Movement Method group box, specify Direct or Use Roads. (For details, please see [“Path Planning for Movement Tasks,”](#) on page 6-7.)
6. Click OK.



When you task an air platform entity to move to a location, be sure to take into account the altitude setting for the object and the terrain the entity has to pass over to complete the task.

Adding Multiple Move To Location Tasks to a Plan

When you add a Move to Location task to a plan, you can add multiple locations without clicking OK and selecting the task again from the menu. Also, since in this method you cannot specify the Z value for each location, you can specify a height above the terrain for the Z value of the succeeding points.

To add multiple Move to Location tasks to a plan:

1. In the Plan Editor for an entity, choose **Task** → **Move to Location**. The Move to Location dialog box opens.
2. Select Each Click Generates A Task.
3. If you want to specify an altitude for the locations, specify an altitude, as described in [“Specifying an Object’s Altitude,”](#) on page 2-10.
4. Click a point on the terrain for each location that you want the entity to move to. A Move To Location task is added to the plan for each location.
5. For ground entities only, in the Movement Method group box, specify Direct or Use Roads. (For details, please see [“Path Planning for Movement Tasks,”](#) on page 6-7.)
6. Click OK.

6.6.18. Move To Waypoint

You can order an entity to move to a point or another entity. Moving to an object is not the same as setting location. Setting location moves an entity instantaneously. Moving to an object simulates an entity traveling through the terrain.

To send an entity to an object:

1. Select the entity.
2. Choose **Task** → **Move to Waypoint**, or click the Move to Waypoint icon () on the Tasks toolbar. The Move To dialog box opens.
3. Optionally, filter the object selection list.
4. In the Name box, type the name of the object to move to, or select the object in the list or on the terrain.
5. For ground vehicles only, in the Movement Method group box, specify Direct or Use Roads. (For details, please see “[Path Planning for Movement Tasks](#),” on page 6-7.)
6. Click OK.



When you task an air platform entity to move to an object, be sure to take into account the altitude setting for the object and the terrain the entity has to pass over to complete the task.

6.6.19. Orbit

The Orbit task allows a fixed-wing aircraft to circle around a point without needing to create a route for it to follow.

To specify an orbit task:

1. Select the entity that you want to orbit.
2. Choose **Task** → **Orbit**. The Orbit dialog box opens.
3. Specify the X and Y values of a point on the terrain around which the entity should orbit. You can click on the terrain to specify the points.
4. Specify the altitude at which to fly.
5. Specify the radius, in meters, of the circle.
6. Select or clear the Clockwise option to specify the direction of travel.
7. Click OK.

6.6.20. Patrol Along Route

When an entity patrols along a route, it moves to the nearest vertex of the route, to the end point, back to the beginning of the route, and then continues going back and forth until given another command.

To order an entity to patrol along a route:

1. Select the entity.
2. Choose **Task** → **Patrol Along Route**, or click the Patrol Along Route icon () on the Tasks toolbar. The Patrol Along Route dialog box opens.
3. In the Name box, type the name of the route to patrol along, or select the route in the list or on the terrain.
4. Click OK.



When you task an air platform entity to follow a route, be sure to take into account the altitude of the vertices and the terrain the entity has to pass over to complete the task.

6.6.21. Patrol Between

An entity can patrol between two point objects, entity objects, or both. When an entity patrols between two objects, it goes to the starting object, then moves back and forth between the two objects.

You can filter the object selection lists independently.

To order an entity to patrol between two objects:

1. Select the entity.
2. Choose **Task** → **Patrol Between**, or click the Patrol Between Points icon () on the Tasks toolbar. The Patrol Between dialog box opens.
3. In the Name box for Point 1, type the name of the first object to patrol between, or select an object in the list or on the terrain.
4. In the Name box for Point 2, type the name of the second object to patrol between, or select an object in the list or on the terrain.
5. Click OK.



When you task an air platform entity to patrol between objects, be sure to take into account the altitude of the objects and the terrain the entity has to pass over to complete the task.

6.6.22. Rotary-Wing Land

The Rotary Wing Land task automates the process of landing a rotary-wing aircraft. Rotary-wing aircraft can land on points.



Although it is possible to land an entity on another entity, such as an aircraft carrier, if you want to embark an entity, you must use the Embark task, not a landing task.

To land a rotary-wing aircraft:

1. Select the entity.
2. Choose **Task** → **Rotary Wing Land**. The Rotary Wing Land dialog box opens.
3. In the Name box, type the name of the waypoint on which you want the entity to land, or select the waypoint in the list or on the terrain.
4. Click OK.

6.6.23. Send Radio Set

The Send Radio Set task lets you send a set data request to an entity using a VR-Forces simulated radio message. The receiving entity executes the set data request as if you had issued it directly to the entity from the Set menu or a set data request in a plan.

To send a set data request radio message:

1. Select the entity that will send the message.
2. Choose **Task** → **Send Radio Set** → *set_data_request*, where *set_data_request* is one of the set data requests on the menu. A dialog box for the set data request opens.
3. In the Name text box, type the name of the entity that will receive the set data request message, or select the entity in the list or on the terrain.
4. If the selected set data request requires input, complete the dialog box as described in Chapter 7, *Issuing Set Data Requests*.
5. To send the message to all entities configured to receive messages from this entity's radio, select the Broadcast check box. (For details about configuring the radio model, please see Section 2.4, “*Configuring Communication Models*”, in *VR-Forces Configuration Guide*.)
6. Click OK.

6.6.24. Send Radio Task

The Send Radio Task task lets you send a task to an entity using a VR-Forces simulated radio message. The receiving entity executes the task as if you had directly tasked the entity from the Task menu or from inside a plan.

To send a task radio message:

1. Select the entity that will send the message.
2. Choose **Task** → **Send Radio Task** → *task*, where *task* is one of the tasks on the menu. A dialog box for the task opens.
3. In the Name text box, type the name of the entity that will receive the task message, or select the entity in the list or on the terrain.
4. If the selected task requires input, complete the dialog box as described in [“Specifying Parameters for Tasks,”](#) on page 6-3.
5. To send the message to all entities configured to receive messages from this entity’s radio, select the Broadcast check box. (For details about configuring the radio model, please see Section 2.4, [“Configuring Communication Models”](#), in *VR-Forces Configuration Guide*.)
6. Click OK.

6.6.25. Send Text Message

The Send Text Message task lets you send a text message to an entity using a VR-Forces simulated radio message. The receiving entity can test for receipt of the message in a conditional statement in its plan. (For details, please see [“The Receive Text Message Condition,”](#) on page 8-13.)

To send a text message:

1. Select the entity that will send the message.
2. Choose **Task** → **Send Text Message**. The Send Text dialog box opens.
3. In the Name text box, type the name of the entity that will receive the text message, or select the entity in the list or on the terrain.
4. In the Message Text box, type the message.
5. To send the message to all entities configured to receive messages from this entity’s radio, select the Broadcast check box. (For details about configuring the radio model, please see Section 2.4, [“Configuring Communication Models”](#), in *VR-Forces Configuration Guide*.)
6. Click OK.

6.6.26. Turn To Heading

The Turn to Heading task provides a realistic way for ground vehicles to turn to a new heading. Rather than turning instantly, as happens with the Set Heading request, a vehicle pivots or makes a K-turn to the new heading. The turning behavior for an entity is controlled by its **can-pivot** parameter in the object parameter database.

To order an entity to turn to a heading:

1. Select the entity.
2. Choose **Task** → **Turn to Heading**. The Turn to Heading dialog box opens.
3. Type a heading.
4. Click OK.

6.6.27. User Task

User tasks are tasks that have been added to VR-Forces using the VR-Forces toolkit. To assign a user task, you must know the name of the task and the required values for up to four parameters.



The User Task command is not available on the Task menu unless a developer adds a controller that accepts a user task.

To assign a user task:

1. Select the entity that you want to execute the task.
2. Choose **Task** → **User Task**. The User Task dialog box opens.
3. Type the name of the task.
4. Type any required parameters.

6.6.28. Wait Tasks

You can order an entity to wait indefinitely, for a specified period of time, or until a specified elapsed simulation time.



The Wait task is not equivalent to an immediate stop task. If an entity is moving and you give it a Wait task, it might not stop immediately, particularly if a controller such as the collision avoidance controller is controlling its movement.

Wait

To order an entity to wait indefinitely:

1. Select the entity.
2. Choose **Task** → **Wait**.



If you give an indefinite wait, the entity does not progress through its plan until it receives another command.

Wait Duration

To order an entity to wait a specific amount of time:

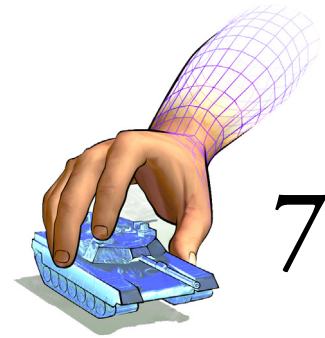
1. Select the entity.
2. Choose **Task** → **Wait Duration**. The Wait Duration dialog box opens.
3. Specify the duration of the wait in hours, minutes, and seconds.
4. Click OK.

Wait Elapsed

To order an entity to wait until a specific elapsed simulation time:

1. Select the entity.
2. Choose **Task** → **Wait Elapsed**. The Wait Elapsed dialog box opens.
3. Specify the elapsed time from the start of the simulation, in hours, minutes, and seconds.
4. Click OK.

For information about simulation time and simulated exercise time, please see Section 3.13.1, “[Simulation Time and Exercise Time](#)”, in *VR-Forces Users Guide*.



Issuing Set Data Requests

This chapter explains how to issue set data requests to entities.

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7.1. Setting Entity State and Attributes

You can set the following entity state values for VR-Forces entities. The Set menu is context sensitive. It only shows the options that apply to the selected entity.

- ♦ Aggregate State
- ♦ Altitude
- ♦ Appearance
- ♦ Armed
- ♦ Capabilities
- ♦ Collision avoidance types
- ♦ Concealed
- ♦ Destroyed
- ♦ Detonation Fuse Type
- ♦ DI-Guy Appearance
- ♦ Disembarked
- ♦ Embarked
- ♦ Emitter
- ♦ Fire Now
- ♦ Force
- ♦ Formation
- ♦ Heading
- ♦ IFF
- ♦ Lase Autonomous
- ♦ Laser Code
- ♦ Location
- ♦ Movement Strategy
- ♦ Notify Level
- ♦ Ordered Speed
- ♦ Posture
- ♦ Reorganize
- ♦ Resource
- ♦ Restore
- ♦ Rules of Engagement
- ♦ Sector of Responsibility
- ♦ Spot Reports
- ♦ Stay in Lane
- ♦ Surrendered
- ♦ Sync Laser Code
- ♦ Target
- ♦ Tasked by Superior
- ♦ Weapon State.

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- ♦ The graphical user interface does not necessarily know about the state of an entity. When you open a dialog box for a Set command, any data in the dialog box represents either default values or the most recently used value, except for the Set Altitude, Set Location, and Set Heading dialog boxes, which show the current values for the selected entity.
 - ♦ You can filter entity selection lists. For details, please see [“Filtering the Object Selection Lists,”](#) on page 6-5.
-

7.2. Set Aggregate State

The Set Aggregate State request lets you change an aggregate from the aggregated state to the disaggregated state and vice versa.

To set an aggregate's aggregation state:

1. Select the aggregate.
2. Choose **Set** → **Aggregate State**. The Aggregate State dialog box opens.
3. Select the desired state from the drop-down list.
4. Click OK.

7.3. Set Altitude

The Set Altitude request changes the altitude of entities immediately. If you want a fixed-wing or rotary-wing entity to move to an altitude, use the Move to Altitude task. You can set the altitude manually or place an entity at a specific level in a multi-level terrain features, such as a building.

To set an entity's altitude:

1. Select the entity.
2. Choose **Set** → **Altitude**, or click the Altitude icon () on the Sets toolbar. The Altitude dialog box opens. It displays the entity's current altitude.
3. Select one of the three options for setting altitude, as follows:
 - On Surface. On the surface at this location. Choose an altitude from the list. For locations that have multiple polygons, you can choose the polygon on which to place the entity.
 - Above Sea Level. The distance above sea level. Type a value. If the terrain is higher than the altitude entered, the entity will be below the surface of the ground.
 - Above Terrain. The distance above the terrain at this location. Type a value.
4. Click OK.

7.4. Set Appearance

You can set appearance attributes for entities. The appearance attributes that are available for an entity are determined by its entry in the `.appData/settings/vrfGui/appearance.mtl` file. The default list of appearance attributes is based on the DIS standard.

The Lifeform State field of the Set Appearance dialog box sets the posture for an entity. If VR-Forces does not support a selected posture, it simulates the entity using the closest similar posture. If a posture involves walking or running, VR-Forces chooses the posture to use based on the entity's speed. For more information about setting posture, please see [“Set Posture,”](#) on page 7-20.

To set appearance values:

1. Select the entity.
2. Choose **Set** → **Appearance**. The Appearance dialog box opens. The settings displayed are the current settings for the entity.
3. Change appearance settings as desired.
4. Click OK.

7.5. Set Armed

IEDs, car bombs, and suicide bombers must be armed to detonate. They are all armed by default. You can disarm them and re-arm them.



IEDs, car bombs, and suicide bombers have radios. Therefore, you can arm and disarm them using the Send Radio Set task.

To arm or disarm an explosive device:

1. Select the IED.
2. Choose **Set** → **Armed**. The Armed dialog box opens.
3. Select an option from the drop-down list.
4. Click OK.

7.6. Set Capabilities

You can set capabilities for entities. The capabilities that are available for an entity are determined by its entry in the `./appData/settings/vrfGui/capabilities.mtl` file. The default list of capabilities is based on the DIS standard.

To set entity capabilities:

1. Select the entity.
2. Choose **Set** → **Capabilities**. The Capabilities dialog box opens. It displays the current settings for the entity.
3. Change the settings you want to change.
4. Click OK.

7.7. Set Collision Avoidance Types

Sometimes entities exhibit undesired collision avoidance behavior because they try to avoid objects that are close to their line of travel, but not necessarily blocking it. You can enable and disable avoidance of entities, buildings, and trees on a per-entity basis. This option overrides the collision avoidance settings in the object parameter database entry for the entity.



- ♦ Collision avoidance settings are saved in an entity's process state repository. However, there is no indication in the GUI what these settings are. Therefore, we recommend that you not change collision avoidance settings through the GUI indiscriminately because you may lose track of which entities are avoiding which types of objects. To permanently set collision avoidance for an entity, edit its components in the object parameter database.
 - ♦ When the Collision Avoidance Types dialog box opens, it does not reflect the settings for the selected entities. It only provides a default setting. Make sure that you review all the settings in the dialog box to be sure you do not inadvertently enable or disable a setting that you do not want to change.
 - ♦ The Set Collision Avoidance Types set data request lets you specify collision avoidance only for broad categories of objects. You can set collision avoidance more specifically in the object parameter database.
-

To change collision avoidance for specific object types:

1. Select the entity.
2. Choose **Set** → **Collision Avoidance Types**. The Collision Avoidance Types dialog box opens.
3. Select the check boxes for object types to avoid and clear the check boxes for the object types that the entity should not try to avoid.
4. Click OK.

7.8. Set Concealed

The Set Concealed request sets an entity's concealment attribute to True or False. This only affects the DIS or RPR FOM data sent over the network. It does not affect the simulation.

To set the concealment attribute for an entity:

1. Select the entity.
2. Choose **Set** → **Concealment**. The Concealed dialog box opens.
3. Select an option from the drop-down list.
4. Click OK.

7.9. Set Destroyed

You can set an entity's state to be destroyed. This can be helpful when you want an entity to be destroyed without having to first simulate its destruction by another entity.

To set an entity's state to destroyed:

1. Select the entity.
2. Choose **Set** → **Destroyed**. The entity is immediately destroyed.

7.10. Set Detonation Fuse Type

The Detonation Fuse Type set data request lets you configure detonation of improvised explosive devices (IEDs), suicide bombers, and car bombs. You can set them to detonate immediately, at a certain time delay, or based on the proximity of a target entity. If you specify proximity detonation, you can set the radius of the proximate area. If you specify time, you must set the time in seconds until detonation. Detonation Fuse Type implicitly arms the device. (For details about arming devices, please see “[Set Armed](#),” on page 7-5.)



IEDs, car bombs, and suicide bombers have radios. Therefore, you can detonate them using the Send Radio Set task.

To configure detonation of an IED or car bomb:

1. Select the IED that you want to configure.
2. Choose **Set** → **Detonation Fuse Type**. The Detonation Fuse Type dialog box opens.
3. In the Fuse Type drop-down list, select the fuse type (Timed, Immediate, or Proximity).
4. If you selected a Timed fuse, in the Time box, specify the elapsed time, in seconds, at which the IED should detonate.
5. If you selected a Proximity fuse, in the Proximity box, specify the radius, in meters, of the area in which an entity will trigger the detonation.
6. Click OK.

7.11. Set DI-Guy Appearance

The Set DI-Guy Appearance set data request determines the clothing and physical characteristics of a lifeform when it is displayed in a 3D simulation that uses DI-Guy characters.



The DI-Guy Appearance set data request applies only to lifeform entities.

To set an entity's DI-Guy appearance:

1. Select the entity.
2. Choose **Set** → **DI-Guy Appearance**, or click the Set DI-Guy Appearance icon () on the Sets toolbar. The DI-Guy Appearance dialog box opens.
3. Select an appearance from the drop-down list.
4. Optionally, in the 3D view only, select the Apply Selected Appearance Immediately check box. This displays the selected entity with the new appearance so that you can see what the appearance looks like before you apply the change.
5. Click OK.

7.12. Set Disembarked

The Set Disembarked set data request immediately disembarks an entity (as opposed to simulating disembarkation, as done by the Disembark task). It is the equivalent of the **Entities** → **Disembarked** command. However, Set Disembarked allows you to include immediate disembarkation in a plan.

To set an entity to be disembarked:

1. Select the entity. (If you are using the 2D icon model set embarked entities are not displayed, so you have to select it in the Objects List Panel.)
2. Choose **Set** → **Disembarked**.

7.13. Set Embarked

The Set Embarked set data request immediately embarks an entity (as opposed to simulating embarkation, as done by the Embark task). It is the equivalent of the **Entities → Embark On** command. However, Set Embarked allows you to include immediate embarkation in a plan.

To set an entity to be embarked:

1. Select the entity to be embarked.
2. Choose **Set → Embarked**. The Embarked dialog box opens.
3. Select the entity to embark on.
4. Optionally, specify a embarkation offset. The default, 0,0,0, puts the entity at the center of the parent entity.
5. Click OK.

7.14. Set Emitter

The radar sensor has an emitter component that models basic electromagnetic emissions. An entity can have multiple emitter components. Each emitter component can have multiple beams.

Emission properties (azimuth, elevation, effective radiated power, and so on) for each beam are specified in the emitter component descriptor in the object parameter database. Emission properties are published by the emitter component.

An emitter component can publish itself as a standard beam type or a tracking beam type. The type is determined by the setting for the **targeting-capable** parameter in the object parameter database. It applies to all beams emitted by the specific component. If **targeting-capable** is False, the beam is a standard beam. If **targeting-capable** is True, it is a tracking beam. If an emitter component has **targeting-capable** set to True, it registers for set-target messages. If you set a target for the entity on which the emitter is mounted, it publishes the target entity as its tracking target for all of the components beams.

Each emitter has an ID that is assigned automatically, starting with 1.

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- ♦ Setting a target does not cause the beam to actually track the target. The beam's behavior is determined by the parameters in its description in the object parameter database.
 - ♦ The emitter will continue to publish the targeted entity as its tracking target until you set another target, regardless of the status of that entity in the exercise. There is no way to set the target to “none”.
 - ♦ Please see Section 8.5, “[Configuring Emitters](#)” in *VR-Forces Configuration Guide*, for an explanation of how to configure individual and multiple emitters in the object parameter database.
 - ♦ Please see the online help for the OPD Editor for a description of emitter parameters.
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To turn on electromagnetic emissions:

1. Select the entity.
2. Choose **Set** → **Emitter**. The Emitter dialog box opens ([Figure 7-1](#)).

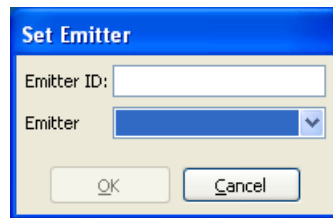


Figure 7-1. Emitter dialog box

3. Type the emitter ID. If the entity only has one emitter, its ID is 1. If it has more than one emitter, IDs get incremented by 1 for each additional emitter. There is no way to identify the emitter ID for a particular emitter, so you will have to use a trial-and-error approach to identify the correct emitter ID to use.
4. In the Emitter drop-down list, select On.

7.15. Set Fire Now

The Fire Now request orders an entity to fire immediately at a specified target. It has the following behavior:

- ♦ The entity fires a single round as soon as possible. It ignores the range, rules-of-engagement, and line-of-sight to the target.
- ♦ Missiles are fired as soon as they are loaded, without aiming. The missile tracks towards the target as best it can.
- ♦ Ballistic guns load and aim toward the target before they fire. If the target is out of range, or not in line-of-sight, the round always misses. If the target is in range and within the line-of-sight, normal probability tables govern the chance of hitting the target.
- ♦ The Fire Now set data request allows you to fire on any entity, including friendly entities.
- ♦ Fire Now does not succeed if the firing entity does not have the appropriate ammunition for the selected target.

To set a Fire Now command:

1. Select an entity.
2. Choose **Set** → **Fire Now**. The Fire Now dialog box opens.
3. Optionally, filter the entity selection list.
4. Select the target from the list. (Or, on the terrain, click on the target entity.)
5. Click OK.

7.16. Set Force

You can change an entity's force during runtime. This might be useful in a simulation in which neutral forces begin assisting one force or another, or in which opposing forces capture friendly force weaponry and begin using it.

When you change an entity's force, its:

- ♦ Echelon ID changes to reflect the new force
- ♦ Icon changes to the appropriate force color and type
- ♦ Force ID changes.

Its entity enumeration does not change. So, for example, if you change the force of an M1A2, which has the country code 225 (United States), it still has the same country code, even though it might now be functioning as part of a force that is opposing United States forces.

To set the force of an entity:

1. Choose **Set** → **Force**. The Force dialog box opens.
2. Select a force from the drop-down list.
3. Click OK.

7.17. Set Formation

VR-Forces supports the following formations:

- ♦ Column (default)
- ♦ Line
- ♦ Wedge
- ♦ Vee
- ♦ User-defined formations.

Formations are defined in formation files in the directory *./data/simulationModel-Sets/<model-set>/vrfSim/formation*. Formation files have the extension *.frm*. In addition to the named formations provided by MÄK, VR-Forces supports user-defined formations. If you create a new formation in the Entity Editor, it automatically gets added to the formation list for the aggregate types that support it.



The vee and wedge formations provided with VR-Forces place the aggregate leader at the end of one of the arms of the formation. If an aggregate has fewer than seven or eight members, it will not be symmetrical.

When you set the formation for a disaggregated aggregate, the entities that make up the aggregate snap to formation immediately. If you want entities to simulate moving into formation, rather than snapping to formation, use the Move Into Formation task.

If you set the formation for an aggregated aggregate, the aggregate remembers the formation and uses it the next time it disaggregates.

To set an aggregate's formation:

1. Select the aggregate whose formation you want to set.
2. Choose **Set** → **Formation**. The Formation dialog box opens.
3. In the Formation list, select the formation that you want the aggregate to use.
4. Click OK.

For information about configuring formations and about how to create user-defined formations, please see Section 8.4, “[Configuring Formations](#)” in *VR-Forces Configuration Guide*.

7.18. Set Heading

The Set Heading request instantly sets an entity's heading. If you want an entity to move to a new heading by pivoting or executing a K-turn, use the Turn To Heading task.

To set an entity's heading:

1. Select the entity.
2. Choose **Set** → **Heading**, or click the Set Heading icon (①) on the Sets toolbar. The Heading dialog box opens. It displays the entity's current heading.
3. In the Heading text box, type a heading, in degrees.
4. Click OK.

7.18.1. Setting an Entity's Heading Manually

You can set an entity's heading by directly manipulating the entity.

To set an entity's heading manually:

1. Double-click the entity.
2. Shift+left mouse button+drag the mouse to change the heading. In the 3D view, you can see the entity rotate to the new heading. In the 2D view, the heading indicator rotates.
3. Left-click.

7.19. Set IFF

Friendly fixed-wing entities can model a NATO Identification Friend from Foe (IFF) transponder.

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- ♦ Mode 5 and mode C are equivalent.
- ♦ The dialog box does not force you to enter valid codes. It truncates invalid entries to the correct length (but not necessarily valid data).

To set the IFF transponder for a fixed-wing entity that is configured with an IFF controller:

1. Select the entity.
2. Choose **Set** → **IFF**. The IFF dialog box opens (Figure 7-2).

Figure 7-2. IFF dialog box

3. Complete the IFF dialog box.

7.20. Set Lase Autonomous

By default, entities with laser capability lase targets autonomously as part of the built-in target acquisition and firing process. You can specifically enable and disable autonomous lasing.

To enable or disable autonomous lasing:

1. Select the entity.
2. Choose **Set** → **Lase Autonomous**. The Lase Autonomous dialog box opens.



The Set Lase Autonomous dialog box does not show the current lasing state of the entity.

3. Select an option from the drop-down list (Off or On).
4. Click OK.

7.21. Set Laser Code

The Set Laser Code set data request sets the code for laser beams sent by an entity and the code that the entity's missiles seek when they fire. By default, VR-Forces calculates a laser code for each laser-capable entity when it is created. You can change the laser code to a code of your choice. For information about the consequences of setting laser codes, please see "[Lasing Targets](#)," on page 9-11.

To specify an entity's laser code:

1. Select the entity.
2. Choose **Set** → **Laser Code**. The Laser Code dialog box opens.
3. Type a number between 111 and 8888, using only the digits 1-8.
4. Click OK.

7.22. Set Location

To move an entity instantly from one place to another, you can set its location or you can drag it to a new location. For information about dragging entities, please see [“Moving an Entity,”](#) on page 3-5. For ground entities, specifying a Z value lets you place an entity at different levels (floors) in building features.

To set the location for an entity:

1. Select the entity.
2. Choose **Set** → **Location**. The Location dialog box opens. It displays the entity's current location. The cursor changes to input mode.
3. Click on the terrain where you want to move the entity, or enter the coordinates of the location in the Set Location dialog box.
4. Optionally, set the altitude, as described in [“Specifying an Object's Altitude,”](#) on page 2-10.
5. Click OK.

7.23. Set Movement Strategy

The Set Movement Strategy set data request determines how ground entities follow roads and routes. The road driving system helps keep vehicles from wandering or trying to avoid obstacles near the roads as they move along roads. It also ensures that vehicles turn corners properly. By default, vehicles that support road driving use it when they are given a task with the Use Roads qualifier. If road driving is disabled, and an entity is given a task with Use Roads selected, it uses the path planning strategy. For details, please see [“Collision, Obstacle, and Feature Avoidance,”](#) on page 3-9.

To set the movement strategy:

1. Choose **Set** → **Movement Strategy**. The Movement Strategy dialog box opens.
2. Select an option in the Enable Road Driving drop-down list.
3. Click OK.

7.24. Set Notify Level

You can set the notification level for entity console messages without opening the Entity Information dialog box.

To set the notification level:

1. Choose **Set** → **Notify Level**. The Notify Level dialog box opens.
2. Select a notification level in the drop-down list.
3. Click OK.

7.25. Set Posture

A lifeform entity (civilian or dismounted infantry) has a posture that determines its position when it is not moving and its type of movement when it is moving. [Table 7-1](#) lists the position and movement relationships for each posture.

Table 7-1: Lifeform posture relationships

Posture	When it is not moving, it is:	When it is moving, it is:
standing	standing	walking or running
kneeling	kneeling	crawling
prone	prone	crawling
running	standing	walking or running
walking	standing	walking or running
crawling	prone	crawling
parachuting	standing	walking or running
jumping	standing	walking or running
sitting	standing	walking
squatting	prone	crawling
crouching	prone	crawling
wading	standing	walking or running

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- ♦ For those postures listed as “walking or running”, VR-Forces sets the movement posture based on the entity’s speed.
 - ♦ If an entity does not support a particular posture, it is set to the closest supported posture.
 - ♦ Setting posture in the Lifeform State field of the Appearance dialog box has the same effect as setting the posture using the Set Posture set data request.
-

To set a lifeform’s posture:

1. Select the lifeform.
2. Choose **Set** → **Posture**. The Posture dialog box opens.
3. Select a posture from the list.
4. Click OK.

7.26. Set Reorganize

If automatic reorganization is not enabled, you can reorganize an aggregate by issuing the Reorganize set data request.

To reorganize an aggregate:

1. Select the aggregate that you want to reorganize.
2. Choose **Set** → **Reorganize**.

The change takes place immediately. For more information about reorganization, please see [“Reorganizing Aggregates,”](#) on page 3-21.

7.27. Set Resources

You can specify the value to assign to a resource. The resources provided with VR-Forces that you can set are fuel and ammunition. The object parameter database lists the ammunition types available for each type of entity.

To specify a resource value:

1. Select the entity.
2. Choose **Set** → **Resources**. The Resources dialog box opens.
3. Select a resource from the Resource list.
4. Specify a value for the resource. The dialog box displays the maximum amount of the resource allowed, as configured in the object parameter database.
5. Click OK.

7.28. Set Restore

Restoring an entity returns its resources to the values specified in the object parameter database. If the entity is destroyed, it returns it to life.



When you restore an aggregate that is in the aggregated state (using Set Restore), the original configuration of the aggregate is recreated. If you restore an aggregate that is in the disaggregated state, then only those subordinates still present in the simulation are restored. Any destroyed subordinates that were previously removed from the simulation as result of a disaggregate-->aggregate-->disaggregate transition are restored. To fully recover all subordinates, restore the aggregate while in the aggregated state.

To restore an entity:

1. Select the entity.
2. Choose **Set** → **Restore**.

The change takes place immediately.

7.29. Set Rules of Engagement

Rules of engagement specify the conditions under which an entity will fire at the enemy.



The rules of engagement for a fixed-wing entity are in effect whether it is on the ground or in the air. If you do not want fixed-wing entities to fire missiles while they are on the ground, you must change the rules of engagement.

To specify the rules of engagement for an entity:

1. Select the entity.
2. Choose **Set** → **Rules of Engagement**, or click the Set Rules of Engagement icon () on the Sets toolbar. The Rules of Engagement dialog box opens.
3. In the Rules of Engagement list, select the rule you want to apply.
4. Click OK.

7.29.1. How Fire-When-Fired-Upon Works

An entity considers itself under fire if either of the following is true:

- ♦ An “Entity Impact” detonation interaction that targeted this entity has recently (within **underFireTime** seconds (default 120)) been received.
- ♦ Any detonation has happened within **underFireDistance** (default 1000 meters) of this entity.

There is no attempt to return fire specifically at the attacking entity. If an entity thinks that it is under fire, it will fire at any enemies that it can target.



The **underFireTime** and **underFireDistance** parameters are top-level entity parameters (like **max-speed**), but they are not in the default *vrfSim.opd* file.

7.30. Set Ordered Speed

When you set an entity’s speed, you are setting its ordered speed, the speed at which you want it to move. It may not move at that actual speed due to soil type, slope, and so on. If you set the speed while an entity is moving, it accelerates or decelerates from the current speed to the new ordered speed.



- ♦ Regardless of the speed that you enter, an entity’s speed cannot exceed the value set by the **max-speed** parameter in the object parameter database.
 - ♦ The Set Speed request sets the ordered speed of a fixed-wing entity in its current context – air or ground. The entity will not exceed the maximum speed for that context. However, if the maximum allowable ground speed is greater than the lift speed of the entity, and you assign an ordered speed greater than the lift speed, when the entity reaches that speed, it will take off.
-

To set the ordered speed of an entity:

1. Select the entity.
2. Choose **Set** → **Ordered Speed**. The Ordered Speed dialog box opens.
3. In the Ordered Speed text box, set the speed, in meters per second.
4. Click OK.

7.31. Set Sector of Responsibility

An entity's sector of responsibility is used with detection tables to determine the priority of targets. Normally, the priority of targets that are outside an entity's sector of responsibility is lower than the priority of targets in its sector of responsibility. For information about the target detection tables, please see Section 8.2, “[Detection Probability Tables](#)” in *VR-Forces Configuration Guide*.

You must specify a sector center and a sector size. Sector center is the center of the area you wish to designate, and sector size is the size of the area, both in degrees. Degrees are measured as 0 to the front (based on the heading), increasing clockwise. If the Turret Scan Controller is mounted on an entity with an articulating turret, then the turret scans the sector of responsibility specified. Sector center is the midpoint of the area. [Figure 7-3](#) illustrates these parameters. The sector size is approximately 140 degrees, a bit less than half the circle. The sector center is at 0 degrees.



The default sector of responsibility is 90 degrees, centered at zero degrees.

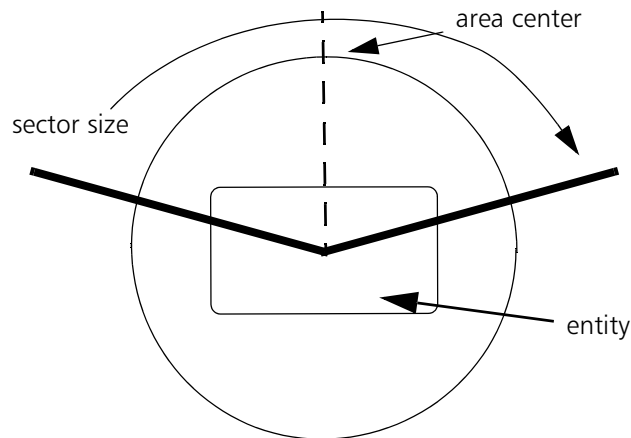


Figure 7-3. Sector of responsibility parameters

To set an entity's sector of responsibility:

1. Select the entity.
2. Choose **Set** → **Sector of Responsibility**. The Sector of Responsibility dialog box opens.
3. In the Size text box, set the size of the area to be scanned, in degrees.
4. In the Center text box, set the center of the scan area, in degrees.
5. Click OK.

7.32. Set Spot Reports

You can set spot reports on or off for all entities from the Spot Reports page of the Application Settings dialog box. You can also set them for individual entities. When you set spot reports on, it means that the entity sends them. Visualization of spot reports is enabled or disabled for the GUI as a whole on the Spot Reports page. For more information about spot reports, including setting them globally, please see [“Displaying Entities Based on Spot Reports,”](#) on page 9-2.



You cannot set an aggregate entity to send spot reports; you can only set spot reports for individual entities. However, you can select multiple individual entities and set spot reports for all of them at the same time.

To set spot reports on or off for an entity:

1. Select the entity.
2. Choose **Set** → **Spot Reports**. The Spot Reports dialog box opens.
3. Select an option from the drop-down list. If you choose On or Off, the setting persists regardless of the global spot report setting. If you want the entity to use the global spot report setting, choose Use Global Setting.
4. Click OK.

7.33. Set Stay in Lane

If a ground vehicle has Stay in Lane enabled, and it encounters a road that is nearly along its desired path of movement, the vehicle drives parallel to the road, maintaining a configured distance from the center line of the road. Once the road ends or is no longer going in the direction the vehicle is moving, the vehicle leaves the road and moves normally.



- ♦ The distance to maintain from the road's center line is specified by the **road-center-offset** parameter in the object parameter database. Positive values are to the right of the center line; negative values are to the left.
 - ♦ To change the default Stay In Lane setting for a vehicle type, change the **stay-in-lane** parameter in its object parameter database entry.
 - ♦ The object parameter database files that ship with VR-Forces disable road following for all entities except the civilian vehicle.
-

To set an entity to stay in its lane:

1. Select the entity.
2. Choose **Set** → **Stay in Lane**. The Stay in Lane dialog box opens.
3. Select an option from the drop-down list.
4. Click OK.

7.34. Set Surrendered

The Set Surrendered set data request only applies to lifeforms. When a lifeform is in the surrendered state, it does not fire at other entities and other entities do not fire at it.

To set an entity to be surrendered:

1. Select the entity.
2. Choose **Set** → **Surrendered**. The Surrendered dialog box opens.
3. Select an option from the drop-down list.
4. Click OK.

7.35. Set Synchronize Laser Code

The Set Synchronize Laser Code set data request lets an entity with laser-guided weapons easily synchronize its laser code with the laser code of the lasing entity. The alternative to this command would be to use Set Laser Code to set the code for the lasing entity and the firing entity.

To synchronize laser codes:

1. Select the entity that has a laser-guide weapon.
2. Choose **Set** → **Synchronize Laser Code**. The Synchronize Laser Code dialog box opens.
3. Select the lasing entity that you want this entity to synchronize with.
4. Click OK. The laser code for the selected entity is changed to match that of the lasing entity.

7.36. Set Target

You can command an entity to specifically target another entity. For this set data request to be effective, the target must be visible to the targeting entity. When you set a target, you override the priorities set by the target selection controller. If the specified target is in the list of candidate targets, it gets the highest priority as a target. However, if the specified target is not visible as a target to the targeting entity, the entity fires at the other available targets. It does not keep looking for the specified target. (You could achieve this behavior by putting a Set Target statement inside a While statement.)

To set an entity's target:

1. Select the entity.
2. Choose **Set** → **Target**. The Target dialog box opens.
3. Optionally, filter the entity selection list.
4. In the Target list, or on the terrain, select the entity to target.
5. Click OK.

7.37. Set Tasked by Superior

You can order an entity that is part of an aggregate, and which is executing its own plan or is conducting an independent task, to stop executing those tasks and take commands from its aggregate. When you order an entity to be tasked by its superior, it stops conducting independent tasks and waits for the next order from the aggregate. (It does not execute the aggregate's current task, if any.) For more information about being tasked by superior, please see [“Independently Tasking Aggregate Members,”](#) on page 6-6.

To order an entity to be tasked by its superior:

1. Select the entity.
2. Choose **Set** → **Tasked by Superior**.

The change takes place immediately.

7.38. Set Weapon State

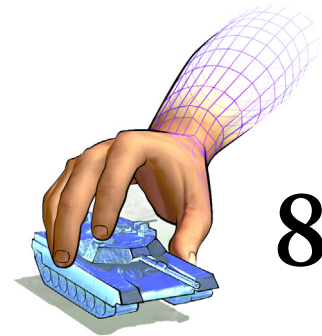
You can set the weapon state for dismounted infantry entities. The options are stowed, deployed, and in-fire-position.



If an entity has an appearance for a weapon state, it uses it in the 3D view. However, some weapon states are not supported for some entities.

To set the weapon state:

1. Select the entity.
2. Choose **Set** → **Weapon State**. The Weapon State dialog box opens.
3. Choose a weapon state from the list.
4. Click OK.



Writing Plans

This chapter explains how to combine tasks, set data requests, global commands, and conditions into plans.

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8.1. Introduction to Entity Plans and Global Plans

A plan contains one or more statements that get executed by VR-Forces without human intervention. You build these statements in dialog boxes. VR-Forces writes the statement to the plan, so you do not have to worry about syntax errors in your statements when you first create them. You must understand the meaning of individual commands and parameters and the implications of how you order them, to make sure that a plan does what you want it to do.

VR-Forces supports two types of plans, entity plans and global plans, which have the following characteristics:

- ♦ Entity plans apply to a specific entity. They contain tasks and set data requests that are specific to the entity and which get executed sequentially. The sequence of task execution can be interrupted by receipt of a task from an external actor (a global plan command or independent task). The task sequence can also be interrupted if a trigger (a form of conditional statement) is activated.



Entity plans can include global commands (which are described later in this section). However, you must be careful not to target global commands, tasks, or sets to an entity in its own plan when you really want entity-specific tasks or sets. Entity tasks are executed sequentially. Sending an entity a global command, even from within its own plan, terminates its plan.

- ♦ Global plans are independent of any entity. The statements in a global plan affect the scenario as a whole (create and delete object commands) or a specific entity (task and set commands). Tasks sent to an entity from a global plan have the same effect on the entity as independent tasks assigned by a human player. They interrupt any task that the entity is engaged in and terminate its plan. Furthermore, if a global plan has a series of tasks for the same entity, they get sent in order without regard to completion of the previous task (as if you issued a series of commands from the Task menu, one immediately after another). In such a case, only the last command sent is likely to be completed.

For an example of how to write a “good” global plan, please see [Global Plans](#), in Chapter 6, [Writing Plans](#), in *VR-Forces Getting Started Guide*.

In [Figure 8-1](#), note that the entity plan window (on the right) is tied to a particular entity (shown in the title bar). It has the same menus as the global plan, plus additional Task and Set menus. The commands on the Task and Set menus in the entity plan apply implicitly to the entity for which you are writing the plan.

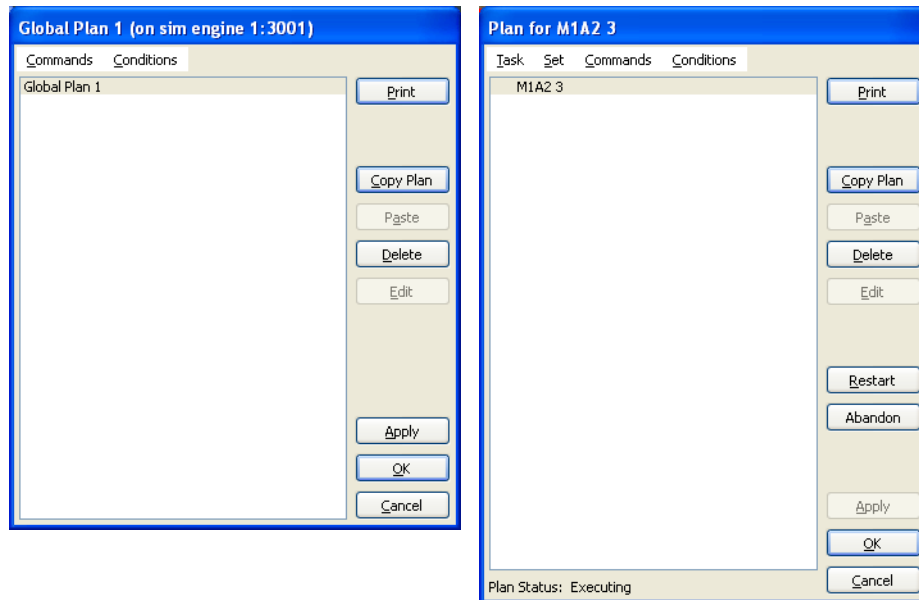


Figure 8-1. Global plan and entity plan

The Commands menu, which is common to both types of plans, contains global commands. These commands allow you to:

- Create and delete objects
- Assign tasks and set data requests to entities
- Send console messages
- Change hostility
- Abandon and restart plans
- Change time of day and weather settings.

Global commands must explicitly state the entity to which they apply.

8.2. Conditional Statements

Many of the statements used in plans set a parameter or direct an entity to perform a specific task unconditionally. However, the plan language also includes the conditional statements, `If`, `When`, and `While`. A conditional statement specifies a condition and a block of plan statements.

- ♦ An `If` statement is evaluated once, when the plan arrives at the statement. If the condition is true at that point, VR-Forces executes the statements in the `If` block.
- ♦ A `When` statement is also called a trigger. It specifies a condition that is evaluated periodically by VR-Forces. If the condition becomes true, VR-Forces executes the statements in the trigger block. A trigger statement lets you plan for a condition without knowing in advance when the condition will occur.
- ♦ A `While` statement executes a block of statements repeatedly while the condition remains true. VR-Forces evaluates the condition when the plan first arrives at the `While` statement. Then it executes the statements in the block. When it completes the statements, it evaluates the condition again. If it is still true, VR-Forces executes the statements again. It continues to do so as long as the `While` condition is true.

The conditions supported by VR-Forces are:

- ♦ Is an entity in a given area? (Entity In Area)
- ♦ Is an entity to the left of a phase line? (Entity Left of Line)
- ♦ Is an entity destroyed? (Entity Destroyed)
- ♦ Is an entity under fire? (Entity Under Fire)
- ♦ Has an entity located a target? (Entity Has Target)
- ♦ Has an entity's embarkation state changed? (Entity Embarked)
- ♦ Is an entity above or below a specified altitude? (Entity Altitude)
- ♦ Has an entity detected another entity? (Entity Detected)
- ♦ Has an entity received a radio message? (Receive Text Message)
- ♦ Has a lifeform surrendered? (Lifeform Surrendered)
- ♦ Does a lifeform have a particular DI-Guy animation? (Entity Di-Guy Animation Check)
- ♦ Does a lifeform have a particular DI-Guy appearance? (Entity Di-Guy Appearance Check)
- ♦ Is a random probability true? (Random)
- ♦ Is an entity resource at a certain level? (Resource)
- ♦ Is the simulation time greater than or less than a specific elapsed time? (Sim Time)

Conditional statements can include the boolean operators `True` and `False`, and the logical operators `AND`, `OR`, and `NOT`.

8.2.1. Specifying Names or Patterns in Conditional Statements

When you add a conditional statement to a plan, you must specify the entity or entities for which the condition will be tested. You can specify:

- ♦ A specific named entity, for example, When entity M1A2 1 is in Area 1.
- ♦ That the condition applies to “Self”, for example, When “I” am in Area 1. Specifying a condition for one’s self makes it easy to copy and paste plans or plan statements to the plans of other entities without doing any editing.
- ♦ An entity enumeration, for example, any entity with enumeration 1:1:225:1:1:3:0 (any M1A2).
- ♦ The inverse of the selection, for example, any entity but myself, or any entity except an M1A2.
- ♦ That for aggregates, the entire aggregate must satisfy the condition (the default), or that any subordinate member of an aggregate satisfies the condition. For example, the default behavior when Entity Is Destroyed is applied to an aggregate is that all members of the aggregate must be destroyed for the condition to be true. The alternative is that the condition is true if any member of the aggregate is destroyed.

The Name and Pattern specifications are mutually exclusive. You cannot specify a name and a pattern. The tab in the Condition dialog box that is visible when you click OK is the specification that gets applied.

Specifying a Name in a Conditional Statement

To specify a named entity in a condition statement:

1. In a conditional statement dialog box, select the Name tab (Figure 8-2).

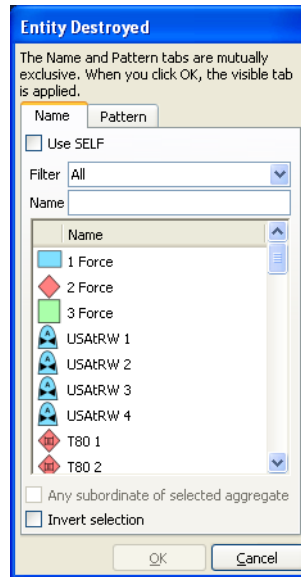


Figure 8-2. Name tab in condition dialog box

2. Do one of the following:
 - To specify the entity whose plan this is as the entity in the condition, select the Use SELF check box.
 - To specify an entity by name, select the entity in the list.
3. If you select an aggregate entity in the list, the Any Subordinate of Selected Aggregate check box is enabled. If you want the condition to be satisfied when any entity in the aggregate meets the condition, select the check box.
4. To specify the inverse of the name, that is, any entity except the selected one, select the Invert Selection check box.
5. Click OK.

Specifying an Entity Pattern in a Conditional Statement

The enumerations used in the Pattern tab are loaded from the file `.\appData\settings\vrffGui\condition-entity-types.csv`. They represent a subset of the enumerations typically used for entities in simulations. However, you can enter any numeric value you want in the enumeration value boxes.

If you expect that you will consistently need to specify enumeration values that are not part of `condition-entity-types.csv`, such as a particular country code, you can edit it to add the patterns you need.

To specify an entity pattern in a condition statement:

1. In a conditional statement dialog box, select the Pattern tab (Figure 8-3).

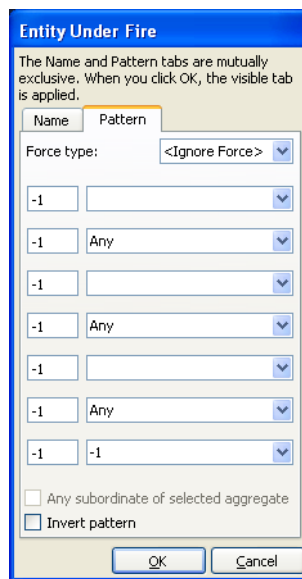


Figure 8-3. Pattern tab in condition dialog box

2. Optionally, specify a force to test for.
3. For each element of the enumeration, type a value in the left column or, if available, select an option from the drop-down list in the right column.
4. If the enumeration you enter is for an aggregate entity, the Any Subordinate Of Selected Aggregate check box is enabled. If you want the condition to be satisfied when any entity in the aggregate meets the condition, select the check box.
5. To specify the inverse of the name, that is, any entity except the selected one, select the Invert Selection check box.
6. Click OK.

8.2.2. The If/Else Statement

An **If/Else** statement tests the current state of an entity.



Do not use an **If** statement to test for receipt of a message or some other circumstance that does not represent an entity's state. VR-Forces does not keep a record of events and such a test will almost always evaluate to false. Use a **When** statement to test for conditions that do not evaluate entity state.

An **If/Else** statement consists of:

- ♦ The word **If**
- ♦ A condition to be evaluated
- ♦ A block of statements
- ♦ An **else** statement
- ♦ Optionally, statements for the **else** condition.

If the condition is true at the moment the **If** statement is evaluated, control passes to the first statement of the **If** block. If the condition is false, control passes to the first statement in the **else** block, if you have one, or to the first statement after the complete **If/Else** block if you do not have an **else** block. You can nest **If/Else** statements within **If/Else** statements. The syntax is as follows:

```
If (condition) then
    zero_one_or_more_statements
else
    zero_one_or_more_statements
endif
```

When VR-Forces reaches the end of the block of **If** or **else** statements, control passes to the first statement after the **If/Else** statement.

The Add Conditional Expression dialog box ensures that you have the correct syntax. It does not ensure that your **If/Else** block makes logical sense.

8.2.3. When Statements (Triggers)

A trigger consists of a **When** statement followed by a block of statements that are executed only if the condition in the **When** statement is true.

When VR-Forces reads a **When** statement, it registers the trigger and checks the condition. If the condition is true, control passes to the first statement in the **When** block. Task execution proceeds as follows:

- If the **When** block contains any tasks that are mutually exclusive with the currently executing task, the current task is discarded and the statements in the **When** block are executed. (If a **When** block is at the beginning of a plan, there might not be a current task. For a discussion about where to place triggers, please see [“Deciding Where to Put Trigger Statements,”](#) on page 8-30.)
- If the tasks in the **When** block are not mutually exclusive with the current task, or if the **When** block only has set data request statements, the **When** statements are executed and the current task continues. For more information about this case, please see [“Using Triggers That Do Not Have Mutually Exclusive Tasks,”](#) on page 8-31.
- After the tasks in the **When** statement block are completed, control returns to the next statement in the entity’s plan.

If the condition is false, VR-Forces continues to the next statement in the plan. It continues to check the trigger condition periodically. If at any point, the condition evaluates as true, control passes to the block of statements associated with the trigger. Task execution proceeds as described in the previous paragraph.

[Figure 8-4](#) illustrates the process when a trigger has a task that is mutually exclusive with the current task. After the tasks in the **When** statement block are completed, control returns to the next statement in the entity’s plan. If the entity was in a **While** loop when the trigger fired, it returns to the next statement in the **While** block.

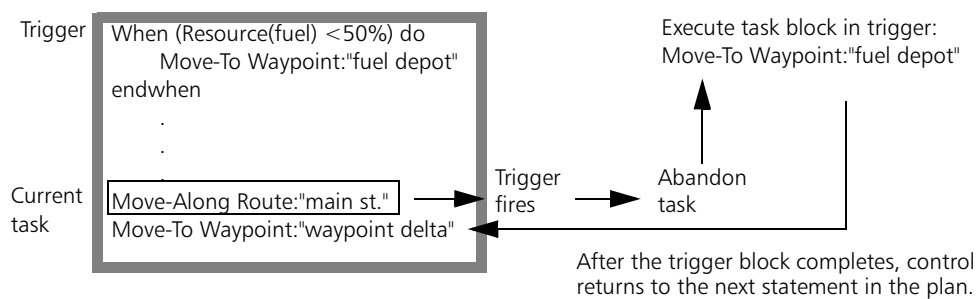


Figure 8-4. Flow of control for triggers

After a trigger fires, it is removed from the list of registered triggers. If you want to continue to test for the same condition, you need to execute another **When** statement for that condition.

Unregistering Triggers

You cannot unregister triggers while a scenario is running. If you do not want a trigger to be executed, you have the following options:

- ♦ Before you start the scenario, remove the trigger from the plan.
- ♦ During a simulation, abandon the plan.
- ♦ During the simulation, remove the trigger from the plan and save the plan. The new plan will erase the old one. However, the plan will begin executing at the first statement, which may not be the behavior you want.

8.2.4. While Statements

A `While` statement consists of:

- ♦ The word `While`
- ♦ A condition to be evaluated
- ♦ A block of statements.

If the condition is true at the moment the `While` statement is reached, control passes to the first statement of the `While` block. If the condition is false, control passes to the first statement after the complete `While` block. You can nest `While` statements within `If`, `When`, and `While` statements.

When VR-Forces reaches the end of the `While` block, it evaluates the condition again. If the condition is still true, VR-Forces executes the statements again. If it is false, control passes to the first statement after the `While` block.

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- ♦ VR-Forces re-evaluates a `while` condition only after it has executed all of the statements in the block. If the condition becomes false while VR-Forces is executing statements in the block, VR-Forces continues to execute all statements because it does not re-evaluate the condition until it completes the `while` block.
 - ♦ If you put a continuous task such as `Wait` or a `Patrol Between` in a `while` block, it is possible that the condition will never be re-evaluated, because the tasks in the block will never be completed.
-

8.2.5. Conditional Tests

This section describes each of the conditions that VR-Forces can test. When you set up conditions, keep in mind the following:

- ♦ If there is no entity with the specified name, the result is always false.
- ♦ If the specified name is destroyed, the condition might never be satisfied. Your plan should take this possibility into account.

The Entity Has Target Condition

Entity Has Target returns true if the entity specified in the condition identifies a target. For example, consider the entities in [Figure 8-5](#). The condition in M1A2 1's plan is true when BMP 1 has a target, not when M1A2 1 targets BMP 1.

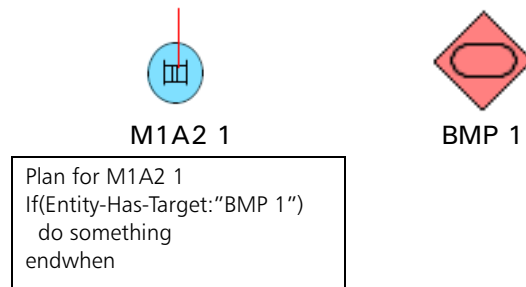


Figure 8-5. Entity Has Target condition

The Entity In Area Condition

Entity In Area returns true if the entity (or member of an aggregate) reports that it is in the named area. You can use the NOT boolean operator, to test whether an entity is outside the area.

The Entity Left of Line Condition

Entity Left of Line returns true if the entity (or member of an aggregate) reports that it is to the left of the specified phase line.

An entity is considered to be to the left of a phase line if it is on the left side of an infinite extension of the phase line as viewed from a point on the line facing in the direction of the line. For a description of phase line direction, please see [“Phase Lines,”](#) on page 3-25.

The Entity Destroyed Condition

Entity Destroyed returns true if the entity (or member of an aggregate) is destroyed.



The definition of destruction for an aggregate is implementation specific. The aggregates supplied by MÄK for VR-Forces report that they are destroyed if every member of the aggregate is destroyed. If you have implemented aggregates locally using the VR-Forces Toolkit, they could have a different definition of destroyed.

The Entity Embarked Condition

Entity Embarked returns true if the named entity is embarked.

The Detect Entity Condition

The Detect Entity condition tests to see if an entity has been detected at a particular identification level. The identification levels are Detected, Classified, Identified, Full Knowledge. Identification levels are determined by the detection probability configuration files, based on the distance between the detecting entity and the target and for how long the entity has been detected. For details about the detection probability files, please see Section 8.2, “[Detection Probability Tables](#)”, in *VR-Forces Configuration Guide*.

The Entity Under Fire Condition

Entity Under Fire returns true if the entity (or member of an aggregate) is under fire.

The Altitude Condition

Altitude returns true if the entity (or member of an aggregate) is at a higher or lower altitude than the one specified.

The Receive Text Message Condition

The Receive Text Message condition tests to see if an entity has received a text message (sent by the Send Text Message task) that contains the text specified in the Receive Text Message dialog box.

The Entity Di-Guy Animation Check Condition

The Entity Di-Guy Animation Check condition tests the current DI-Guy animation for a lifeform. This condition may be useful if you are scripting a series of animations. For example, if a particular entity is using a threatening or hostile animation, you might want to have other entities respond a certain way.

The Entity Di-Guy Appearance Condition

The Entity Di-Guy Appearance Check condition tests the current DI-Guy animation for a lifeform. This condition may be useful if you are scripting a lifeform’s interaction with another lifeform based on ethnicity or how they are dressed.

The Lifeform Surrendered Condition

The Lifeform Surrendered condition tests to see if a lifeform entity has surrendered (using the Set Surrendered set data request).

The Sim Time Condition

The Sim Time condition returns true if the elapsed simulation time is greater than (Sim Time >) or less than (Sim Time <) the time specified in the statement. Sim Time is the elapsed simulation time in days, hours, minutes, and seconds.

The Resource Condition

The Resource condition tests the amount of a specified resource using comparison operators.

The Random Condition

You can use the Random condition to randomly decide an entity's behavior at run time.

Percentage – A floating point probability percentage value between 0% (zero) and 100%. Random returns true if a random number between zero and 100 is less than or equal to the specified value.

If you use the Random condition, consider the following issues:

- ♦ Random is not very useful in triggers, since triggers may evaluate their condition expressions as often as once per tick. This means that a trigger expression of “Random Probability:50%” is likely to fire within the first couple of times it is evaluated. Therefore, we recommend that you not create triggers that are based on a random condition.
- ♦ If you use a random condition in a cascading sequence of **If/Else** statements, and you want to ensure the correct probability distribution, be careful how you specify the percentage value. For example, randomly selecting one of three paths with equal probability would be done like this:

```
If (Random Probability:33.33%) then
    Move-Along Route:"1"
Else
    If (Random Probability:50%) then
        Move-Along Route:"2"
    Else
        Move-Along Route:"3"
    Endif
Endif
```

- ♦ As with all other random numbers used in VR-Forces, if the scenario initializes a random number seed value (for details, please see “[Scenario Parameters](#),” on page 3-4 in *VR-Forces Configuration Guide*), then the results of the Random condition can be made repeatable. (For details about repeatability, please see “[Exercise Clock Modes](#),” on page 3-36.)

Boolean and Logical Operators

You can use the following boolean and logical operators in conditional expressions:

- ♦ **True**
- ♦ **False**
- ♦ **AND** (*expression*, *expression*) – evaluates as true if both conditional expressions are true.
- ♦ **OR** (*expression*, *expression*) – evaluates as true if either of the expressions are true.
- ♦ **NOT** (*expression*) - evaluates as true if the conditional expression is false.

You can nest and combine conditional expressions.

8.3. Viewing Plans

You can view an entity's plan and observe its progress through the plan. You can view the plans for as many entities at a time as you want. In addition to viewing plan status in the Plan window, you can view the current task on the State page of the Entity Information dialog box.

To view an entity's plan:

1. Select the entity whose plan you want to view.
2. Choose **Entities** → **Plan**, or press **p**. The Plan window opens.

The task that an entity is executing is highlighted in the Plan window. when the entity completes its plan, a message is displayed in the status area at the bottom of the Plan window.

8.4. Writing Entity Plans

This section explains how to write entity plans. For conceptual information about plans, please see “Plans,” on page 3-27 and the previous sections in this chapter.

When you write a plan, keep the following considerations in mind:

- If you edit a plan during a simulation, when you apply the changes, the entity whose plan has been changed begins executing it from the beginning. This might mean its activities are no longer synchronized with those of the other entities, unless the updated plan only includes statements that you want to execute starting at the current point of the simulation. Therefore, we recommend that you edit plans when you first load a scenario, before you start running the simulation.
- If you have two or more Plan windows open at the same time, and you open a dialog box, such as Move To, but do not complete the command, you cannot open that same dialog box from another Plan window until you complete the one that is open.

To edit an entity's plan:

1. Select an entity.
2. Choose **Entities** → **Plan**, or press **p**. The Plan window opens. The entity's plan is displayed.

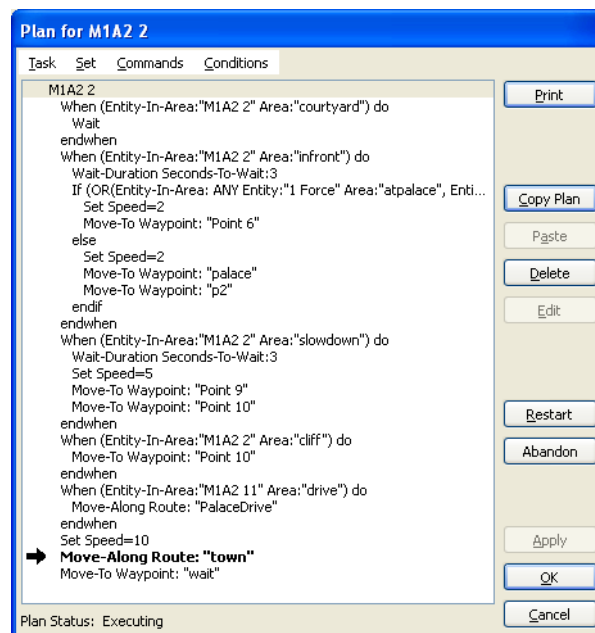


Figure 8-6. Plan window

3. Add new statements, edit statements, or delete statements as described in the following sections.

8.4.1. Adding an Entity Task or Set Data Request to a Plan

When you add statements to an entity plan, you add them after the currently selected statement. (For details about adding tasks to a global plan, please see [“Adding Global Commands to a Plan,”](#) on page 8-23.)

To add a task to a plan:

1. Open the Plan window for an entity.
 2. In the Plan window, select the statement immediately above where you want to insert a new statement. If the plan does not have any statements yet, the plan root – “*Entity_name*” is already selected.
 3. Choose **Task** → *Task*, where *Task* is a task listed on the menu. A dialog box appropriate to the task opens. The procedures for filling out each type of task dialog box are described in Chapter 6, [Assigning Tasks](#).
 4. Complete the required parameter information.
 5. Click OK in the task dialog box to add the statement. You can click Cancel at any time to exit a task dialog box.
- To add a set data request to a plan, follow the same procedure as for adding a task, except choose **Set** → *Set Data Request*.

The procedures for filling out Set statement dialog boxes are in Chapter 7, [Issuing Set Data Requests](#).



Some task and set statements, such as Wait, or Reorganize, do not require you to specify any values. They are added immediately to the plan without any intermediate dialog boxes.

8.4.2. Adding a Conditional Statement to a Plan

To add a conditional statement to a plan:

1. Open the Plan window for an entity.
2. In the Plan window, select the statement immediately above where you want to insert a new statement. If the plan does not have any statements yet, the plan root – *Entity_name* is already selected.
3. Choose **Conditions** → *condition*. The conditional expression dialog box opens.
4. Complete the conditional expression dialog box as described in [“Building Statements in the Conditional Expression Dialog Box,”](#) on page 8-19.



Once you make a selection from a list, you cannot change it. If you make an error building a conditional expression, you will have to Cancel out of the dialog box and start over again.

5. Click OK. A conditional statement block is added to the plan, with the syntax (the condition plus an “end” statement) that defines the bounds of the block of tasks that are executed if the condition is true. You need to add the task statements that you want to have executed. To add the task statements, follow the procedure in [“Adding an Entity Task or Set Data Request to a Plan,”](#) on page 8-17.

Building Statements in the Conditional Expression Dialog Box

The conditional expression dialog box is a dynamic dialog box that lets you build a conditional statement. It contains lists that have the permissible options for each step of a condition. As you select options, the dialog box redisplay, adding additional fields. You can build conditional statements using comparison operators, logical operators, and tests of entity status.

Using Prefix Notation to Establish Grouping and Precedence

To specify grouping, the Conditional Expression dialog box uses prefix notation, in which the operator comes first, followed by the operands. For example, a condition that you might say as, “If entity 1 is in area A and entity 2 is in area B,” is expressed in prefix notation as:

```
AND(entity 1 in area A, entity 2 in area B)
```

(For simplicity, this example does not use complete VR-Forces statement syntax.)

If you are not familiar with prefix notation, you might want to write out your conditional expressions before you begin entering them in the Conditional Expression dialog box.

[Figure 8-7](#) illustrates how the Conditional Expression dialog box might redraw as you successively add the components of a condition statement. It creates the following conditional expression:

```
If (AND(Entity-In-Area Entity:"M1A2 1" Area:"base camp",
        resource(fuel)<25%)) then
else
endif
```



The conditional expression dialog box resizes as you add conditions.

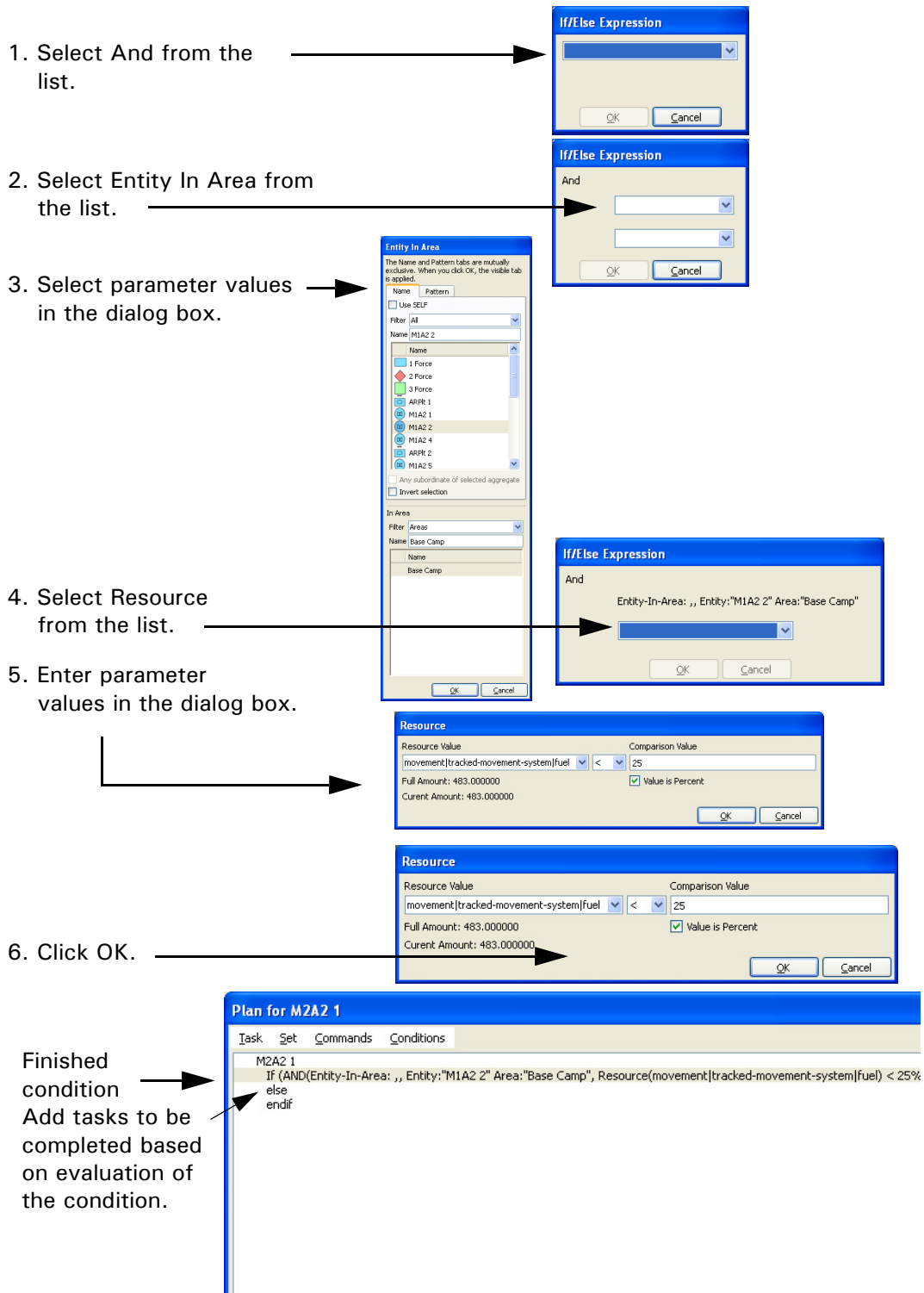


Figure 8-7. Example of building a conditional statement

8.4.3. Editing a Statement

You can edit simple statements in the Plan window. If you want to change a complex conditional statement, you must delete it and re-enter it.

To edit a plan statement:

1. Double-click the statement or select the statement and click the Edit button. An edit dialog box for the particular statement type opens.
2. Enter the changes you want to make.
3. Click OK in the edit dialog box.
4. Click OK or Apply in the Plan window.

8.4.4. Deleting Statements from a Plan

You can delete statements from a plan individually, or all at once. You can delete the individual statements in the statement block of a conditional statement. If you delete the conditional statement itself, all substatements are also deleted.

To delete a statement from a plan:

1. Select the statement you want to delete.
2. Click the Delete button or press **Delete**.

Deleting All Statements From a Plan

To delete all statements in a plan:

1. Select the top line in the plan.
2. Click the Delete button or press **Delete**.

8.4.5. Printing Plans

You can print plans. The printout lists the name of the scenario, the entity's name, and the plan statements.

To print a plan:

1. Open a global plan or the Plan window for the entity whose plan you want to print.
2. Click Print. A standard print dialog box for your operating system opens.
3. Complete the dialog box as you normally would.

8.4.6. Saving Changes to a Plan

You can save changes to a plan and continue editing, or save changes and exit the Plan window. The plan is saved to the scenario plan file. You do not specify a file to save it to.

- To save changes to a plan, in the Plan window click Apply or OK.

8.5. Creating Global Plans

Global plans are not tied to a specific entity. However, since they must be executed by a simulation engine, they are assigned to a specific back-end, just like objects are.

To create a global plan:

1. Choose **Simulation** → **Global Plans**. The Global Plans window opens ([Figure 8-8](#)). It lists each global plan and the simulation engine on which it is executed.

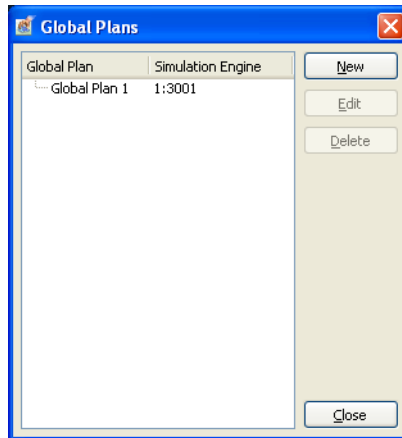


Figure 8-8. Global Plans window

2. Click New. The New Global Plan Information dialog box opens.
3. In the Plan Name box, type a name for the plan.
4. If your scenario has more than one back-end, select the back-end on which you want to run the global plan.
5. Click OK. The Global Plan window opens ([Figure 8-9](#)).

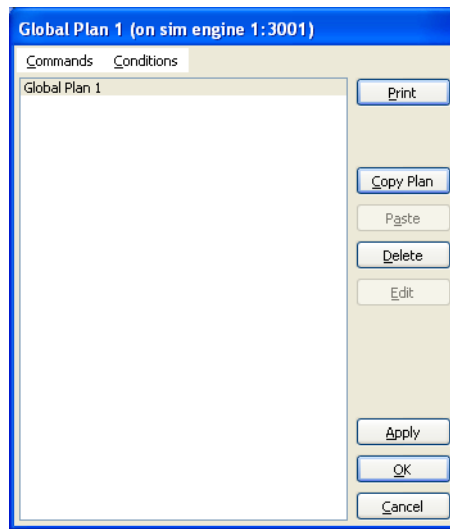


Figure 8-9. Edit Global Plan window

6. Add commands as described in [“Adding Global Commands to a Plan,”](#) on page 8-23.

8.6. Adding Global Commands to a Plan

The global command submenus mimic the Create, Task, and Set menus on the VR-Forces menu bar. There are also several global commands that are only available on the Commands menu. Except as noted in this section, the procedures for adding global commands and conditional statements to a global plan are the same as the procedures for adding them to entity plans.

8.6.1. Adding a Global Task or Set to a Plan

The commands on the Task and Set menus in an entity plan apply implicitly to the entity for whom you are writing a plan. Global commands must be assigned explicitly to a target entity. Therefore, even though the list of tasks and sets on the Commands menu look the same as those in an entity plan or the main VR-Forces menu bar, the dialog boxes they use are different.

[Figure 8-10](#) shows the Follow Entity dialog box displayed if you choose **Commands** → **Task** → **Follow Entity** in a global plan, and the Follow Entity dialog box displayed if you choose **Task** → **Follow Entity** in an entity plan. The right pane in the global command requires the same information as the local command. The difference is that in the global command dialog box you must specify the entity to which the command will apply. You can specify an existing entity or you can specify the name of an entity that does not yet exist, but which you expect to be created during the lifetime of the scenario, perhaps as the result of a Create command in a global plan.

Other than the requirement to specify the target entity, adding a global task or set command to a plan uses the same procedure as adding any task or set to an entity plan.

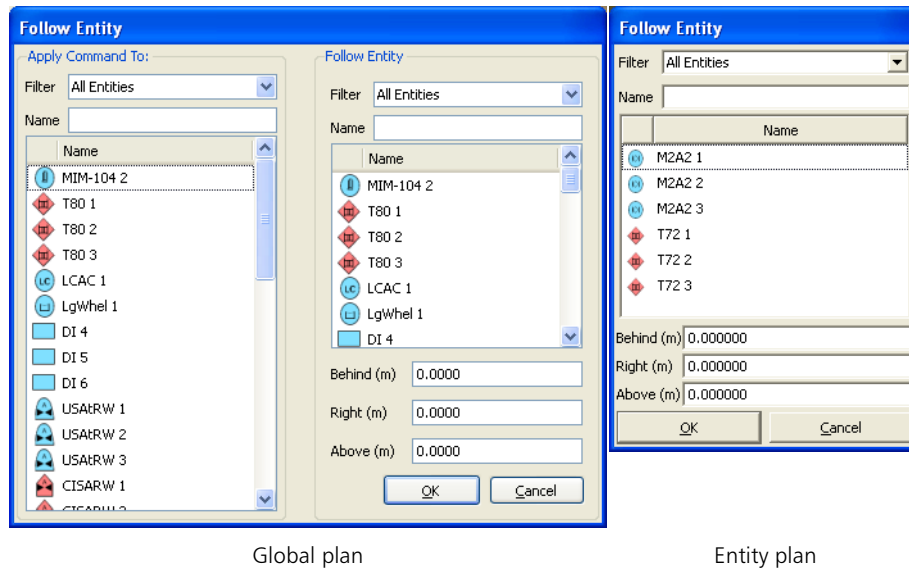


Figure 8-10. Global command task dialog box and entity plan task dialog box

To assign a global command:

1. In a Plan window or Global Plan window, choose one of the commands on the Commands menu or a submenu. The appropriate dialog box opens for the command.
2. If the dialog box requires you to specify the entity that will execute the command (in other words, if there is an Apply Command To panel in the dialog box), select an entity from the list or type its name in the Name box. The entity does not have to exist in the scenario at the time you add the command, but you should be sure that it will be created before the command is run.

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Remember that a global task command affects an entity like an independent task. It interrupts the current task and causes the entity to abandon its plan. If you are adding a global task command to an entity plan, be sure that you are assigning it to some other entity and not the entity for whom you are writing the plan. (Unless you want the entity to abandon its plan.)

3. In the command-specific panel of the dialog box, complete the command parameters. Please see Chapter 6, *Assigning Tasks* and Chapter 7, *Issuing Set Data Requests* for the details of assigning specific tasks and sets.

8.6.2. Sending Console Messages

You can send messages to be displayed in the console on an object's information dialog box and to the back-end console. Messages sent by global plans go to the back-end console. Messages sent from an entity's plan go to the console in its Entity Information dialog box.

If the notification level for a console message is lower than the notification level configured for the back-end or the target entity, the message is not displayed. For example, if an entity's notification level is set to Info, it receives Error, Warn, and Info messages, but not messages set to Verbose or Debug.

To send a console message from a plan:

1. In an Entity Plan or Global Plan window, choose **Commands** → **Console Message**. The Console Message dialog box opens.
2. Select the notify level from the list.
3. Type the message you want to send.
4. Click OK.

8.6.3. Creating Objects from Within a Plan

You can create any of the objects on the Create menu from within a plan.

To create an object from a plan:

1. In an Entity Plan or Global Plan window, choose **Commands** → **Create** → *object*, where *object* is an entity, control object, or overlay object accessible from the submenus.
2. Create the desired object as you would if you were creating it directly from the main Create menu, except that if you are creating an entity, you can only create one entity at a time and you can specify a name and location for the entity in the Create Object panel. When you are finished creating the object, a create command is added to the plan and the object itself disappears. (The object disappears because you are not actually creating the object right now, you are just creating the command that will create it later when the plan executes.)

8.6.4. Deleting Objects from Within a Plan

You can delete any object in a scenario from a plan.

To delete an object from a plan:

1. In the Entity Plan or Global Plan window, choose **Commands** → **Delete Object**. The Delete Object dialog box opens.
2. Type the name of the object you want to delete or select the object in the list or on the terrain.
3. Click OK.

8.7. Writing Plans for Aggregates

To write a plan for an aggregate:

1. Select the aggregate.
2. Follow the procedures for writing a plan for an individual entity.



Please see “[Independently Tasking Aggregate Members](#),” on page 6-6 for notes about how entities that are members of aggregates respond to individual plans and independent tasks.

8.8. Writing a Plan for Multiple Entities

You can write a plan and assign it to multiple entities at the same time. If any of the entities already have a plan, it is overwritten by the new plan. After you assign a plan using this procedure, you can individually edit the plans for any entity and the changes do not affect the other entities.



If you select several entities and they all have the exact same plan, the plan window displays that plan. If any of the entities have different plans, you are given the option to continue or cancel. If you continue, VR-Forces displays an empty Plan window and the new plan replaces the whatever plans the entities previously had.

To write a plan for multiple entities:

1. Select the entities to which you want to assign the same plan.
2. Choose **Entities** → **Plan**. The Plan window opens.
3. Add statements to the plan as you would if you were writing a plan for an individual entity.
4. Click OK. The plan is assigned to the selected entities.

8.9. Writing Plans for Remote Entities

If you attach components to remote entities, you can write plans for those entities. To assign plans, the entities must exist in the exercise, must have attached components, and must be present in the exercise when VR-Forces saves the scenario. The plans must be appropriate for the attached components. Movements tasks are not appropriate, because VR-Forces cannot control the location of a remote entity. Appropriate plan statements might be to enable spot reporting, or to send a radio message. For details about how to attach components to remote entities, please see Section 8.12, “[Configuring VR-Forces Components on Remote Entities](#)”, in *VR-Forces Configuration Guide*.

8.10. Copying Plans and Plan Statements

You can copy plans and individual plan statements and paste them into another entity's plan.

To copy plan statements:

1. Open the Plan window for the plan that you want to copy.
2. To copy the entire plan, select the top line in the plan (*Entity_name*). To copy a statement, select the statement. If you select a conditional statement, the entire statement block is selected.
3. Click the Copy button. If you selected the top line, it reads Copy Plan. If you select a statement, it reads Copy Block.
4. Open the Plan window for the entity you want to copy the plan to.
5. Select the line just above where you want to insert the copied plan.
6. Click Paste.
7. Continue editing the plan as described in the previous sections.
8. Save the plan.

8.11. Restarting a Plan

There may be occasions when you want to restart an entity's plan without restarting a scenario. You can restart a plan interactively or by placing a Restart Plan command in a plan.

When you restart a plan, VR-Forces processes the statements in the plan, starting from the first statement. However, the entity executes tasks starting from its current location, not the location it had at the start of the scenario (unless it has not moved since the start of the scenario).

To restart a plan interactively:

1. Select the entity whose plan you want to restart.
2. Choose **Entities** → **Restart Plan**.

To restart a plan from within a plan:

1. Open an entity's plan or a global plan.
2. Choose **Commands** → **Restart Plan**. The Restart Plan dialog box opens.
3. Select the entity whose plan you want to restart.
4. Click OK.
5. Save the plan.

To restart a plan from the Plan window:

1. Open an entity's plan.
2. Click Restart.

8.12. Abandoning a Plan

You can order an entity to stop executing its plan. When you abandon a plan, the following things happen:

- ♦ The entity stops whatever task it is working on, even if it is an independent task
- ♦ The plan is marked as complete
- ♦ All registered triggers are deleted
- ♦ The statement indicator skips to the end of the plan
- ♦ The entity enters a wait state.

You can abandon a plan interactively or by sending an Abandon Plan command in an entity or global plan.

To abandon a plan interactively:

1. Select the entity whose plan you want to abandon.
2. Choose **Entities** → **Abandon Plan**.

To abandon a plan from within a plan:

1. Open an entity's plan or a global plan.
2. Choose **Commands** → **Abandon Plan**. The Abandon Plan dialog box opens.
3. Select the entity whose plan you want to abandon.
4. Click OK.
5. Save the plan.

To abandon a plan from the Plan window:

1. Open an entity's plan.
2. Click Abandon.

8.13. Considerations for Creating Plans

This section has tips for constructing plans including how to avoid problems that are hard to debug and how statements affect each other, with implications for how to organize the statements in a plan.

8.13.1. Name Changes Can Invalidate Plan Statements

Plan statements can reference named objects, such as tactical graphics and entities. For example, a Follow Entity task specifies the name of the entity to follow. If someone changes the name of an entity or tactical graphic after you create a plan, VR-Forces will not be able to find the object referenced in the plan statement. If this happens in a task statement, the plan skips the task and moves to the next task. If a renamed object is in a conditional statement, the condition may never become true.

8.13.2. Considerations for Using Triggers

Triggers are a versatile part of plans and you should have a good understanding of their intricacies before you use them.

Deciding Where to Put Trigger Statements

VR-Forces does not evaluate a trigger condition until it executes a **When** statement and registers the trigger. If you want to ensure that a **When** statement always gets read by VR-Forces, put it at the beginning of a plan before any non-trigger statements. If you put a trigger later in a plan, it is possible that it will never be registered. This could occur if a plan is abandoned. Of course, you might decide that you do not want a trigger to be registered unless a set of preceding tasks have been completed. In that case, placing it later in the plan may be exactly what you want to do.

You can also place a trigger inside a conditional block so that it gets registered only if a particular condition is true at a particular time.

For example, if you always want entity 1 to respond to entry of hostile forces into an area, put a trigger at the beginning of the plan. If you want entity 1 to respond to a hostile entity in an area only after the simulation has progressed for 15 minutes, nest the trigger inside another trigger that fires when Sim Time > 15 minutes.

Using Triggers That Do Not Have Mutually Exclusive Tasks

A trigger does not have to have any task statements in its statement block. It could just have Set statements. Or, it could have sets and concurrent tasks. If a trigger block just has Set statements, it does not interrupt the task that the entity is executing when the trigger gets executed. The Set statements get executed while the entity is performing its task. This has the same effect as if you manually set the entity's state while it was performing a task.

Using a trigger that just has Set statements can be useful if you want to change an entity's state under certain conditions, but do not know in advance when those conditions might exist.

Reregistering Triggers

A trigger can only fire once. It does not stay in effect for a reoccurrence of the triggering event. Under limited circumstances it is possible to work around this limitation. If an entity's plan only contains When statements, you could put a Restart Plan command at the end of each When block. In this way, after a trigger fires, it executes the commands in the trigger block and then it restarts the plan. This reregisters all of the When statements in the plan.

If a plan has commands outside of a trigger, then restarting the plan would also cause the entity to execute those commands, which might not be desirable.

8.13.3. Moving In Formation

If you want an aggregate to move in a certain formation, add a Set Formation statement to the plan before the task that requires the aggregate to move. The default formation is a column.

8.13.4. Using the Set Tasked-By-Superior Request in a Plan

If you put the Set Tasked-By-Superior request in the body of a plan, it has no real effect. This is because, as soon as it is set, the plan goes to the next task and overrides the superior. The only way that the Set Tasked-By-Superior command gets implemented as part of a plan is if it is the last statement in a plan or the last statement in a trigger that happens to get executed after all the statements in an entity's plan have been executed.

8.13.5. Following Entities

If you tell two or more entities to follow another entity, do not give them the same offset values. If the followed entity stops, one follower will arrive at the specified offset position and stop, while the others will circle the location because they cannot all occupy the same space.

8.13.6. Planning Tasks for Aircraft

When you plan tasks for aircraft, the most important thing to remember is to pay attention to the terrain. Fixed-wing aircraft do not have terrain following capabilities. Rotary-wing aircraft have some terrain-following capacity, but it has some limitations. So if you assign aircraft an altitude that is lower than the terrain at some point along a route or the path they must follow to reach a waypoint, they will crash into the terrain. View the terrain profile for a route to see if it intersects the terrain.

You should also bear in mind that the turning radius and speed of fixed-wing aircraft affect how closely they can follow a route.

8.13.7. Using Non-VR-Forces Entities in Plans

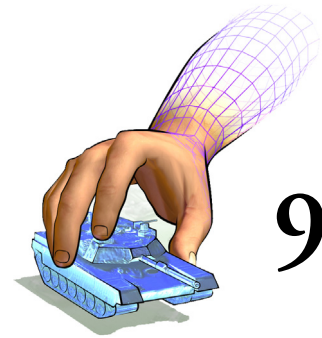
You can use a non-VR-Forces entity as a parameter in a plan, for example, following a remote entity, or testing to see if a remote entity is in an area.

To identify non-VR-Forces entities, VR-Forces uses their marking text. If a non-VR-Forces entity does not have marking text, VR-Forces uses its entity identifier as its name.

VR-Forces does not recognize remote aggregates as aggregates, so it cannot check their children. Remote aggregates are ignored by the simulation engine.



- ♦ Referring to remote entities by their marking text may have unpredictable results if there is more than one remote entity with the same marking text.
 - ♦ If you include a non-VR-Forces entity in a plan you must ensure that the remote simulator uses the same name for the entity in future runs.
-



Target Detection and Combat Features

The chapter describes VR-Forces features related to target detection and acquisition – spot reports, hostility relationships, lasing, and munition damage.

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9.1. Displaying Entities Based on Spot Reports

A spot report is a report by an entity to members of its force that it has detected a member of another force.

By default, VR-Forces displays entities based on complete ground truth. That is, it shows all entities in their exact location. However in real-world combat and training situations, participants rarely know where all other entities are, including those in their own force. This is called the fog-of-war. VR-Forces can simulate a semblance of the fog-of-war by displaying entities based on spot reports, rather than ground truth.

When you display entities based on spot reports, you do not see all members of forces other than your own. You only see spot reports for other-force entities that have been detected by members of your force. Spot reports are represented by icons that are similar to entity icons, but they do not move as entity icons do. Furthermore, since spot reports lose value over time as entities move to different locations, VR-Forces maintains a certainty level for the location of other forces. If a detected entity is not detected again for a period of time, its certainty decreases and its icon becomes increasingly transparent to show that it is less certain that the entity is at the reported location.

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- ♦ Generating spot reports can reduce the performance of the simulation engine.
 - ♦ When you rewind a scenario, the global spot report setting persists. Spot report settings for individual entities revert to the settings saved with the scenario.
-

9.1.1. Enabling or Disabling Spot Reports

You can enable or disable spot reports globally or per entity. To set spot reports for an entity, use the Set Spot Reports set data request, as described in “Set Spot Reports,” on page 7-25.

Enabling or Disabling Spot Reports Globally

When you enable or disable spot reports globally, the setting is applied to all entities that have not explicitly set spot reports on or off with the Set Spot Reports set data request. The setting persists, which allows you to set an entity to use the global spot report setting.

To enable or disable spot reports for all entities:

1. Choose **Settings** → **Application**. The Application Settings dialog box opens.
2. Select the Spot Report Options page.
3. Select the Enable/Disable Spot Reports tab (Figure 9-1).

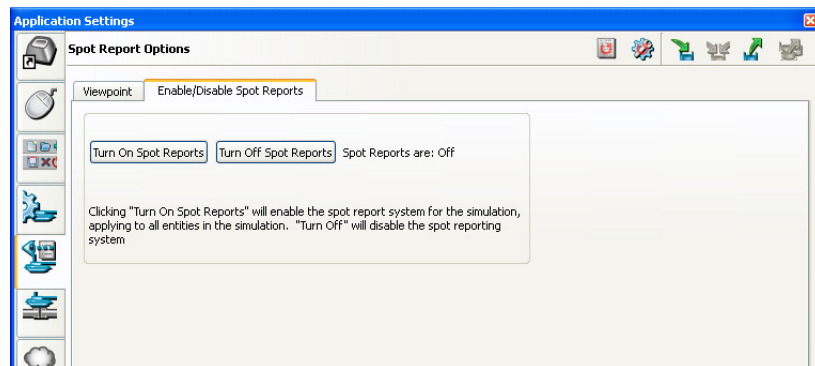


Figure 9-1. Spot Report Options page, Enable/Disable Spot Reports tab

4. Click Turn on Spot Reports or Turn Off Spot Reports. The change takes effect immediately.

9.1.2. Configuring the Spot Reports Viewpoint

The spot report viewpoint determines which entities and objects are shown using ground truth and which are shown using only spot reports. You can select preconfigured viewpoints or create custom viewpoints.



When you rewind a scenario, the viewpoint configuration stays the same as in the previous run of the scenario. The global spot report setting stays the same. Entity-specific spot report settings revert to the settings saved with the scenario.

Selecting a Preconfigured Spot Report Viewpoint

VR-Forces provides viewpoints for the Friendly, Opposing, and Neutral. In each of these viewpoints, VR-Forces displays ground truth for the viewpoint force and spot reports for the other forces. For example, if you select the Friendly force viewpoint, all entities in Force 1 are displayed showing ground truth. All other entities are displayed only if they have been detected by a friendly entity that is configured to send spot reports.

When you select a preconfigured viewpoint, the check boxes in the windows in the Map View group box are automatically set to match the selected viewpoint.

To configure spot reports:

1. Choose **Settings** → **Application**. The Application Settings dialog box opens.
2. Select the Spot Report Options page.
3. Select the Viewpoint tab ([Figure 9-2](#)).

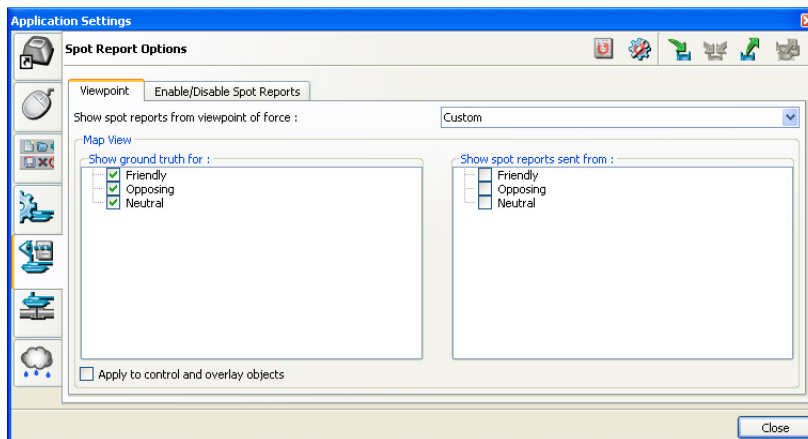


Figure 9-2. Spot Report Options page, Viewpoint tab

4. Select an option in the Show Spot Reports from Viewpoint of Force list.

Configuring Custom Spot Report Viewpoints

If you do not want to use a preconfigured viewpoint, you can create a custom viewpoint. This option allows you to see ground truth and spot reports from a mix of forces. When you create a custom viewpoint, the Show Spot Reports from Viewpoint of Force list displays the viewpoint that you have created (usually Custom).

It is possible to create a custom configuration in which no objects are displayed, so think carefully about your choices.

To configure a custom viewpoint:

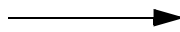
1. Choose **Settings** → **Application**. The Application Settings dialog box opens.
2. Select the Spot Report Options page.
3. Select the Viewpoint tab ([Figure 9-2](#)).
4. In the Show Ground Truth For window, select the forces for whom you want ground truth to be displayed. You would usually select the same forces as the ones selected in the Show Spot Reports Sent From window.
5. In the Show Spot Reports Sent From window, select the forces whose spot reports you want to display. In other words, if you are not showing ground truth for the Opposing force and only want to see the Opposing force entities that are detected by Friendly and Neutral entities, then select the Friendly and Neutral check boxes.

Configuring Same-Side Fog-of-War

There may be cases when you want to simulate same-side fog-of-war. That is members of a force do not know where other members of their force are unless detected by an entity and reported using a spot report.

To simulate same-side fog-of-war, you must edit the *spot-report-generator.sysdef* file. You might want to create a customized file that you can assign only to the entities that you want to simulate same-side fog-of-war. (You can use the Entity Editor to change the spot report systems that entities use.) In the system definition file change the **send-spot-reports-on-own-force** parameter to **True**, as follows:

```
(spot-report-generator-system
  (controllers
    (spot-report-generator
      (component-descriptor-type
        "spot-report-generator-controller-descriptor")
      ...
      (object-types-to-spot-report
        (object-type 1 (1 -1 -1 -1 -1 -1 -1))
        (object-type 1 (3 -1 -1 -1 -1 -1 -1))
        (object-type 1 (5 -1 -1 -1 -1 -1 -1))
      )
      (send-spot-reports True)
      (send-spot-reports-on-own-force True)
      (send-spot-reports-on-hostile-forces True)
      (send-spot-reports-on-neutral-forces True)
    )
  )
  ...
)
```



You can edit the system definition file by hand or in the OPD Editor. For details about the OPD Editor and the Entity Editor, please see *VR-Forces Configuration Guide*.

9.1.3. Applying Spot Reports to Tactical Graphics

You can display tactical graphics based on spot reports rather than ground truth. The same criteria are applied to their display as are applied to the display of entities. For information about how to assign objects to a force, please see [“Creating Tactical Graphics,”](#) on page 5-4.

To apply spot reports to tactical graphics:

1. Choose **Settings** → **Application**. The Application Settings dialog box opens.
2. Select the Spot Report Options page.
3. Select the Viewpoint tab ([Figure 9-2](#)).
4. Select the Apply to Control and Overlay Objects check box.

9.2. Managing Force Hostility Relationships

By default, VR-Forces categorizes entities as members of friendly, opposing, or neutral forces. Friendly forces and opposing forces are hostile to each other. Neither is hostile towards neutral forces. You can change force hostility relationships dynamically. This may be particularly useful if you are simulating an environment in which civilian populations become hostile to a particular force, or in which armed militias, for example, switch allegiances to other forces.

You can add new forces in the Entity Editor. For details, please see Section 5.12, “[Managing the Forces List](#)” in *VR-Forces Configuration Guide*. You can change a force’s hostility in a global or entity plan. For details, please see “[Changing a Force’s Hostility in a Plan](#),” on page 9-8.

You can change the default hostility relationships by editing the *forceHostility.mtl* file for the simulation model set you are using (for example, *./data/simulationModelSets/default/forceHostility.mtl*).

When you change force hostility at runtime, the changes are saved as part of the scenario. The hostility loaded with a scenario overrides the hostility loaded by the simulation model set’s hostility file.

i

Hostility relationships are not reciprocal. For example if you set neutral force entities to be hostile to friendly force entities, that does not mean that friendly force entities are hostile to neutral force entities.

To change the force hostility matrix:

1. Choose **Simulation** → **Hostility Matrix**. The Hostility Matrix opens ([Figure 9-3](#)). Each row in the matrix lists the hostility relationships between that row’s force and all of the other forces (represented by color-coded columns).



Figure 9-3. Hostility Matrix

2. For each row in the matrix, select the check boxes in the columns for the forces that you want this force to be hostile towards. Clear the check boxes for forces that you do not want it to be hostile towards.
3. Click OK.

9.2.1. Changing a Force's Hostility in a Plan

To change a force's hostility in a global or local plan:

1. Open a global plan or an entity's plan.
2. Choose **Commands** → **Change Hostility**. The Change Hostility dialog box opens (Figure 9-4).

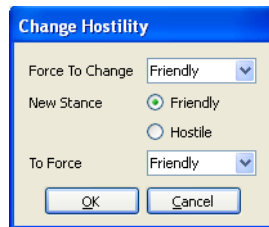


Figure 9-4. Change Hostility dialog box

3. In the Force to Change list, select the force whose hostility you want to change.
4. In the To Force list, select the force towards which you want to change hostility.
5. Select the new force relationship (New Stance), either Friendly or Hostile.
6. Click OK. The command is added to the plan.

9.3. Detecting Targets

Entities can have one or more sensors, for example, visual, sonar, or radar, for detecting and identifying other entities. When an entity detects another entity, it assigns it a combat identification (CID) level. If it continues to maintain contact with the entity, it upgrades the CID level as follows:

- ♦ CID Level 0 – not detected
- ♦ CID Level 1 – Detected: the entity is detected, but only its platform is known, for example, ground
- ♦ CID Level 2 – Classified: the entity's category is known, for example, tank
- ♦ CID Level 3– Identified: the entity's category and subcategory are known, for example M1A2
- ♦ CID Level 4 – Full Knowledge: all visible information about the entity is known.

CID levels are assigned based on the distance to the detected entity and the length of time that the entity has been in contact. You can configure these values in the detection tables (*./data/simulationModelSets/default/vrfSim/detection/*.csv*). For details about these configuration files, please see Section 8.2, “[Detection Probability Tables](#)”, in *VR-Forces Configuration Guide*.

By default, entities do not fire at a detected hostile entity until it achieves the Identified level. You can configure this behavior by changing the **detection-level-to-set-hostility** parameter in the entity's sensor system. For details about editing entity parameters, please see *VR-Forces Configuration Guide*.

[Figure 9-5](#) shows a series of screen captures of an entity as its CID level is advanced from Detected through Identified. In this scenario, spot reports are enabled. Therefore, when an entity is detected, it is displayed with a yellow icon, rather than the normal color for the force. It is not given the correct force color until the detected entity is CID level Identified.

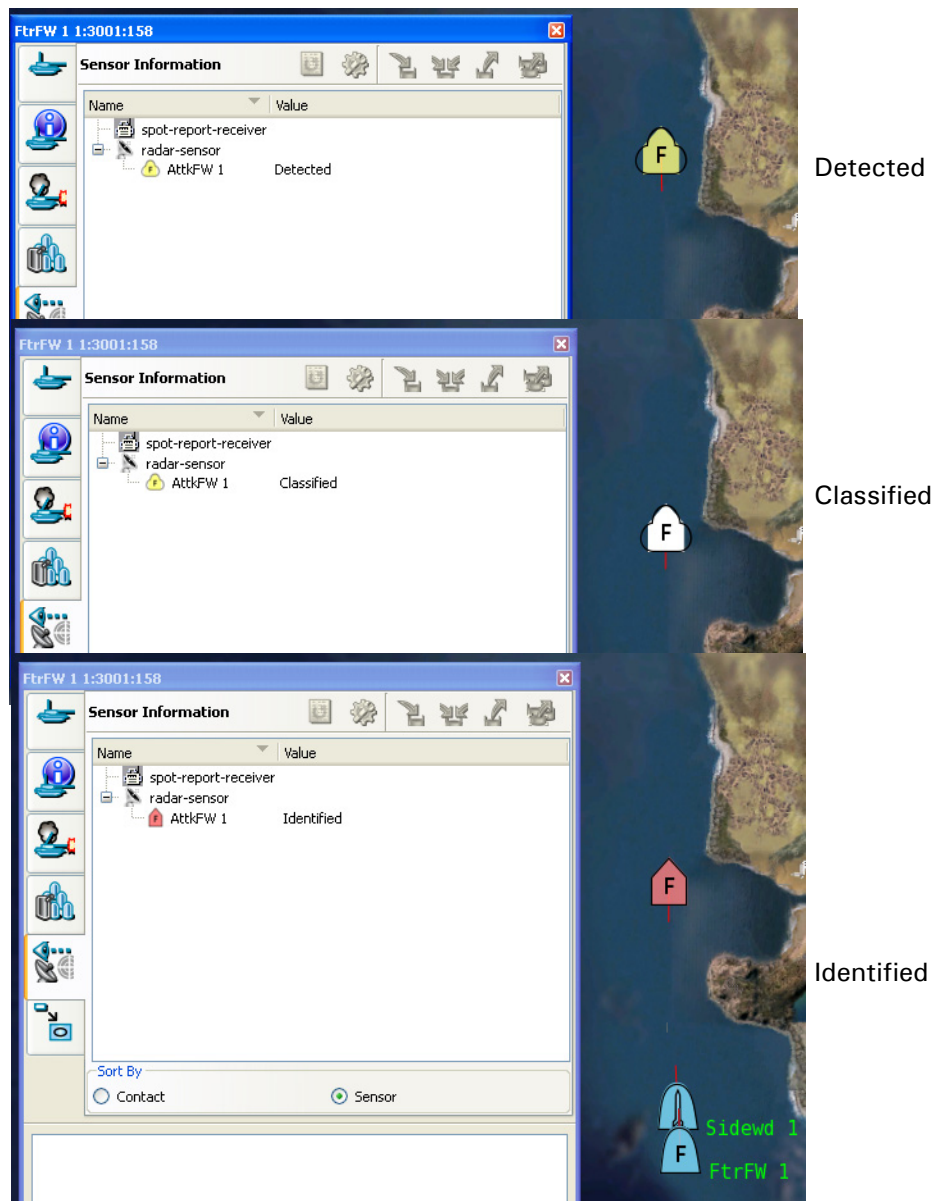


Figure 9-5. Entity classification and display when spot reports are enabled

9.3.1. Target Detection and Spot Reports

Entity detection and classification can be enhanced by enabling spot reports. Detected entities are assigned CID levels based on length of contact and distance from the detecting entity. In some cases, such as a fixed-wing aircraft flying quickly over a battle-field, or an entity that is at the extreme of its range from a target, contact might not be sufficient to advance to the Identified CID level. In such cases, even though the entity is technically capable of firing on the target, it might not do so because the CID level is not high enough.

If spot reports are enabled, the classification of entities in the spot reports that an entity receives is combined with the directly sensed information. Therefore, if an entity classifies a target at a low CID level, but it receives a spot report that classifies the target at a high CID level, it can fire on the target based on the CID level in the spot report. For example, as noted in the previous paragraph, a fixed-wing aircraft is unlikely to maintain contact with a ground-based entity long enough to elevate its CID level to Identified. However, if a member of its force on the ground identifies the target and sends out a spot report indicating CID level 3 or 4, when the fixed-wing aircraft receives the spot report, it can add the target to its target list.

9.3.2. Lasing Targets

Some entities, such as DI Lasing, have laser-targeting capability. Others, such as attack helicopters, have laser targeting capability and carry laser-guided missiles. Laser-guided missiles do not use the standard VR-Forces targeting mechanisms. They only fire on targets that are identified by laser beams that have the same laser code as the laser-guided missile launcher. The laser beam could be generated by a laser designator on the same entity (autonomous lasing), or could be generated by another entity.

Laser codes are numbers in the range of 111-8888, using only the digits 1-8. By default, VR-Forces calculates a unique laser code for each entity when it is created. When you assign a laser code to an entity, any laser beams sent by that entity use the assigned laser code and the missiles carried by that entity (if applicable) use the same code. Therefore, for example, the default behavior for attack helicopters would be to fire their laser-targeted missiles only at targets that they have lased.



A laser-guided missile launcher must be able to see a laser spot and an appropriate target before it fires. If the missile loses the laser spot before it hits the target, it tracks to the last known laser spot.

Autonomous Lasing

By default, entities that have laser-guided missiles are configured for autonomous lasing. This means that they can lase targets and fire at them without outside intervention (for example, using the Lase Target task). Entities with autonomous lasing enabled identify and fire at targets independently, just like entities that use conventional munitions.

Synchronizing Laser Codes

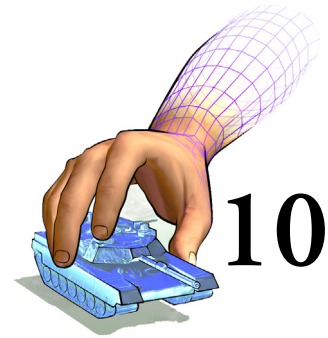
There are cases in which you will want more than one entity to use the same laser code. For example, you might want one entity to lase targets (the designator), and another one to fire on them (the shooter). In this case you would assign both entities the same laser code. The designator would be given the hold-fire rule of engagement or not have any missile resources. The shooter would be configured to not lase targets (Set Laser Autonomous would be set to Off). It would just fire on the targets identified by the designator's laser.

You can synchronize the laser codes of the lasing entity and the firing entity by setting them for each entity with the Set Laser Code set data request, or you can let VR-Forces synchronize the codes with the Set Synchronize Laser Code set data request. For details, please see [“Set Laser Code,”](#) on page 7-18 and [“Set Synchronize Laser Code,”](#) on page 7-27.

9.4. Taking Damage from Munitions

Entities can be damaged by munitions fired by other entities. They can be damaged by direct fire – a munition that hits the entity or within a configurable distance of the entity, and by indirect fire – a munition that explodes within a configurable distance of the entity. An entity can also suffer collateral damage. This can occur if an entity is hit by direct fire of sufficient power to damage nearby entities.

The types of munitions to which an entity is vulnerable is determined by its damage system. Each damage system has a damage actuator, which specifies damage files. These damage files specify how entities are damaged by direct and indirect fire from specific munitions. *VR-Forces Configuration Guide* describes damage systems and damage files. The important point to remember as a VR-Forces user is that an entity will not be harmed by a munition unless it has a damage system that knows about that munition. And, if you introduce a new munition type, it will not harm any entities unless their damage systems have a damage file for the new munition.



Environment Settings

This chapter explains how to set the time of day and weather conditions.

Setting the Time of Day and the Weather	10-2
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Setting Weather Conditions.....	10-3

10.1. Setting the Time of Day and the Weather

You can set the time of day and weather conditions from the front-end and in plans. The time of day and weather conditions are back-end settings, not merely front-end display effects. They affect entity sensors and line-of-sight. For example, if visibility is set to 4 kilometers, an entity will not see an entity that is 5 km away. If the time of day changes from daytime to nighttime, lighting conditions in the 3D view change accordingly.

The time of day advances as simulation time advances. However, they are not directly tied to each other. For example, if at the start of a simulation (simulation time 0:00:00:00), you set the time of day to 10:00 AM, after eight hours of simulation time passes, the time of day will be 6:00 PM. However, you could just as easily set the initial time of day to some other time or change it at will during the course of the simulation. These changes would not affect the elapsed simulation time in any way. They would just change the starting point for the advance of the time of day.

Time of Day and Global Weather are options on the Commands menu in global plans and entity plans.

10.2. Setting the Time of Day

As time advances, the time displayed on the Environment Settings toolbar changes. The time of day setting is independent of simulation time.

To set the time of day:

1. Choose **Simulation** → **Environment Settings**, or click the Time of Day icon (☀️) on the Environment Settings toolbar. The Environment Settings dialog box opens.
2. Select the Time of Day page (Figure 10-2).

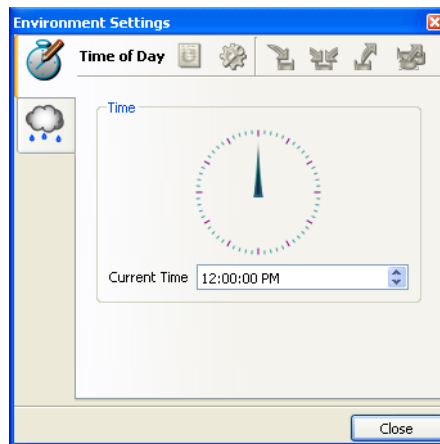


Figure 10-1. Weather page

3. Set the time of day by typing a value in the Current Time box or by using the spin control to select a time.

10.3. Setting Weather Conditions

You can set the following weather conditions:

- ♦ Cloud cover
- ♦ Visibility
- ♦ Precipitation
- ♦ Wind speed and direction.

When you specify weather, the back-end sends out state updates with these conditions. Entities respond to them only if their model has the ability to do so.

To set weather conditions:

1. Choose **Simulation** → **Environment Settings**, or click the Time of Day icon (☀️) on the Environment Settings toolbar. The Environment Settings dialog box opens.
2. Select the Weather page (Figure 10-2).

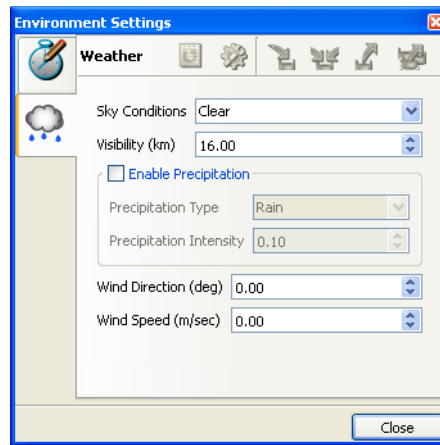


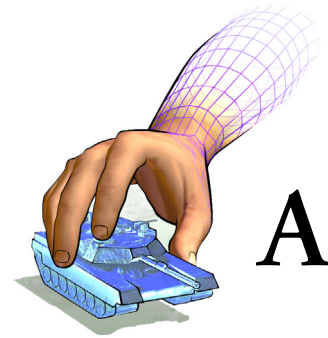
Figure 10-2. Weather page

3. To set cloud cover, select an option on the Sky Conditions drop-down list.
4. To set visibility, type a value in the Visibility box or use the spin control to set the value.



If precipitation is enabled, the range of values available for visibility is constrained by the precipitation intensity. If intensity is high, the maximum visibility is low.

5. To enable precipitation, select the Enable Precipitation check box.
6. Choose the precipitation type, rain or snow, in the Precipitation Type list.
7. To set precipitation intensity, type a value in the Precipitation Intensity box or use the spin control to choose a value.
8. Set the wind direction, in degrees, in the Wind Direction box.
9. Set the wind speed, in meters per second, in the Wind Speed box.
10. Click Close.



Example Scenarios

VR-Forces includes several sample scenarios. This appendix explains how to create the breaching scenario and the embarkexample scenario. It assumes some basic knowledge of VR-Forces concepts and the VR-Forces interface, such as how to select objects, how to pan and zoom the terrain, and so on. If you have not yet reviewed the sample tutorial in *VR-Forces Getting Started Guide*, you may want to try that tutorial before trying these example scenarios.

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Create the Opposing Forces.....	A-6
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A.1. The Breaching Scenario

This scenario simulates a breaching exercise. In this exercise, four hostile vehicles are arrayed behind a minefield. Three platoons of four tanks each suppress the hostile vehicles, allowing two engineering vehicles to clear the minefield.

Figure A-1 illustrates the order of battle and tactical graphics in the scenario. (The terrain is hidden to enhance clarity.)

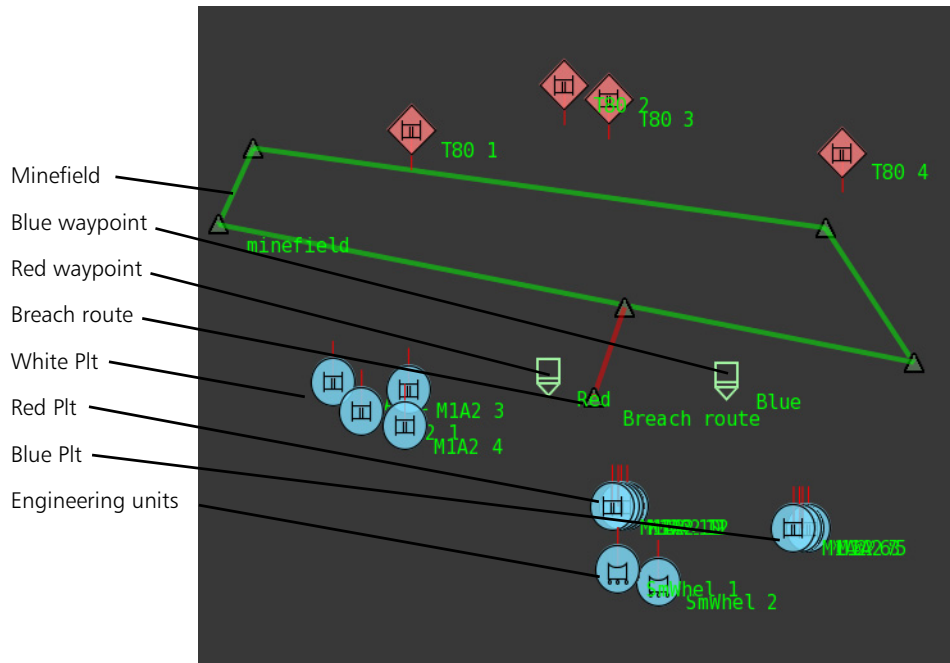


Figure A-1. Breaching scenario order of battle

Figure A-2 illustrates the scenario with the terrain visible.

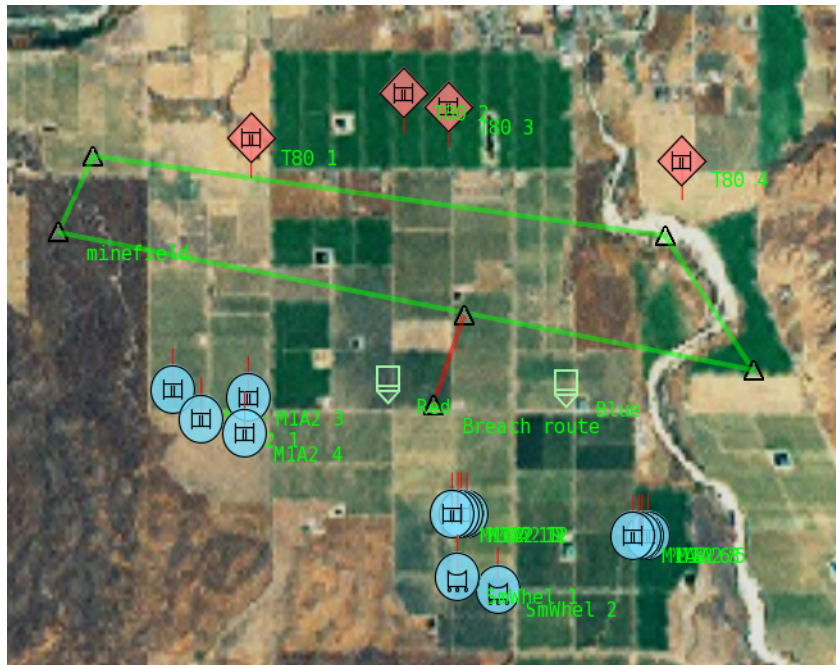


Figure A-2. Breaching scenario

The scenario demonstrates the following features of VR-Forces:

- ♦ Creating entities from the Create menu and the Entity Palette
- ♦ Creating tactical graphics (waypoints, routes, areas)
- ♦ Creating a pre-defined aggregate and creating an aggregate from individual entities
- ♦ Creating plans, using:
 - Move To
 - Follow Entity
 - Follow Route
 - Conditions.

The scenario plays out as follows for the Blue force units:

- ♦ White Platoon stays in position and fires on hostile forces.
- ♦ Red Platoon advances to waypoint red and provides cover for the engineers.
- ♦ Blue Platoon advances to waypoint blue and provides cover for the engineers.
- ♦ The engineering entities follow behind Red Platoon. When the hostile forces are destroyed, the engineering entities advance on the minefield to clear it.



The scenario has entities that represent engineering entities, but VR-Forces does not actually have models for engineering entities.

A.1.1. Create the Scenario

To create the scenario:

1. Start VR-Forces. The VR-Forces window opens.
2. Choose **File** → **New Scenario**. The Select Simulation Database dialog box opens.
3. Select a terrain database. We used the *SanLuisObispo.mtf* database.
4. Click Open. The New Scenario dialog box opens.
5. Type a name in the Scenario Name box, such as Breaching Scenario. We will accept all of the default values for the scenario parameters.
6. Click OK. The San Luis Obispo database is displayed. This database covers a portion of California, U.S.A.

Save the Scenario

Save the scenario periodically as you work on it.

To save the scenario:

1. Choose **File** → **Save Scenario**. The Save Scenario dialog box opens.
2. Click the New Folder icon. A new folder is added to the window.
3. Type a name for the new folder, such as myBreaching.
4. Select the folder.
5. Type a name for the scenario, such as myBreaching.
6. Click OK.

A.1.2. Create the Minefield

We will create the minefield first, since it becomes a good reference around which to create the entities and other objects.



VR-Forces does not have a minefield tactical graphic. We will use an area to represent the minefield.

To create the minefield:

1. Zoom in on a relatively flat portion of the terrain. This is to minimize the impact of hilly terrain and intervisibility issues on how the simulation runs. For this scenario, we used an area just to the Northeast of the center of the terrain ([Figure A-3](#)).



Figure A-3. San Luis Obispo terrain

2. Choose **Create** → **Area**. The Create Area tab is added to the side of the window.
3. Click the Create Area tab. The Create Area dialog box opens ([Figure A-4](#)).
4. In the Name box, type Minefield.

5. Draw an oblong area to define a minefield (Figure A-4). Click to define the first three vertices. Right-click to define the last vertex.

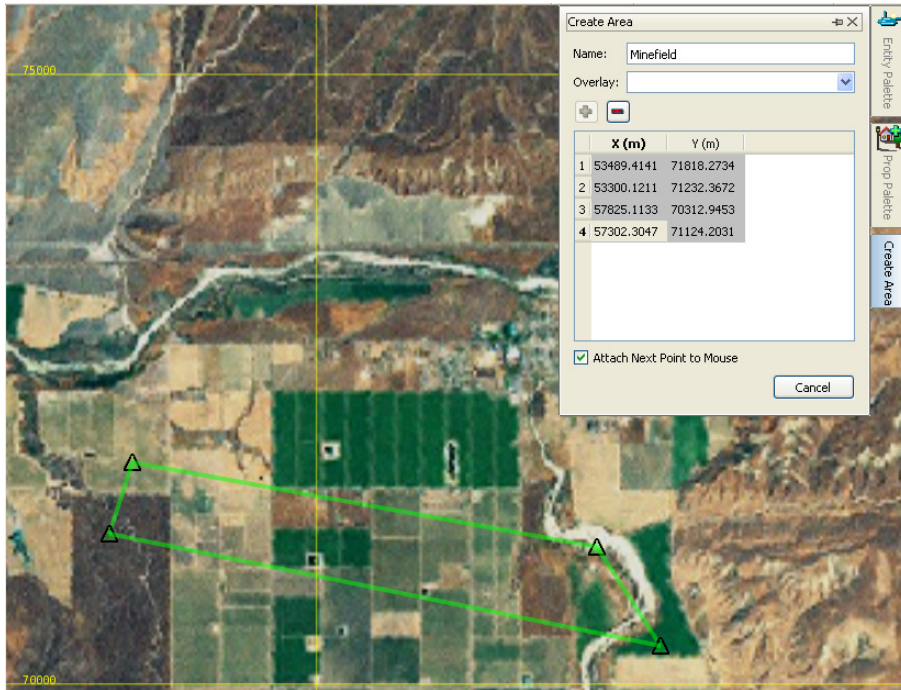


Figure A-4. Create the minefield

A.1.3. Create the Opposing Forces

Now that we have the minefield as a reference point, create the hostile entities.

1. Choose **Create** → **Ground** → **Opposing** → **T-80 Main Battle Tank**. The cursor changes to draw mode and shows an entity icon.
2. Click on the map north of the minefield four times, as indicated in Figure A-1, to place the T-80s.
3. Right-click to exit create mode.

Aggregate the Opposing Forces

We will want to test for when all of the opposing forces are destroyed. This will be easier to do if they are in an aggregate.

To aggregate the opposing forces:

1. Select the four T-80 tanks.
2. Choose **Entities** → **Aggregates As**. The Aggregate As dialog box opens ([Figure A-5](#)).

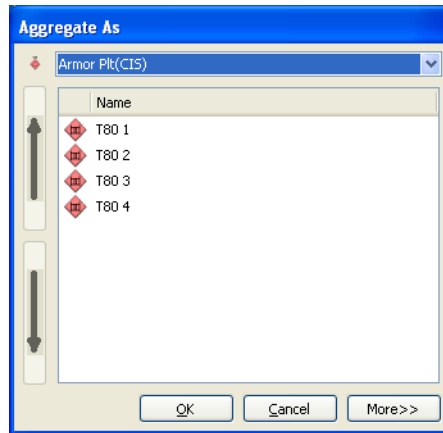


Figure A-5. Aggregate As dialog box

3. In the list, select Armor Plt(CIS).
4. Click OK. The tanks are aggregated into a platoon.
5. In the Echelon View tab on the Object tab, expand the aggregate ([Figure A-6](#)).

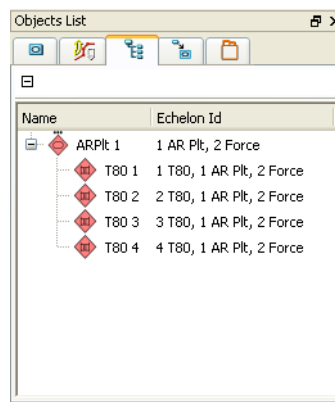


Figure A-6. Echelon View

A.1.4. Create the Tactical Graphics

We need to create two waypoints and a route for the Blue Force.

Create the Waypoints

To create the waypoints:

1. Choose **Create** → **Waypoint**. The Create Waypoint tab is added to the window.
2. Click the Create Waypoint tab. The Create Waypoint dialog box opens.
3. Type a name for the waypoint, such as Red.
4. Using [Figure A-1](#) as a guide, click on the map where you want to place the waypoint for Red platoon.
5. In the Create Waypoint dialog box, type a name for the second waypoint, such as Blue.
6. Click on the terrain where you want to place the waypoint.
7. Right-click to exit draw mode.

Create the Route

The route will guide the engineers as they swing past the Red Platoon and move to the minefield. The route is shown as Breach route in [Figure A-1](#).

1. Choose **Create** → **Route**. The Create Route tab is added to the window.
2. Click the Create Route tab. The Create Route dialog box opens.
3. Type a name for the route, such as breach route.
4. Click on a point just east of waypoint red.
5. Move the mouse cursor to the edge of the minefield.
6. Right-click to place the end point in the route.
7. Save the scenario.

At this point, the scenario should look something like [Figure A-7](#).

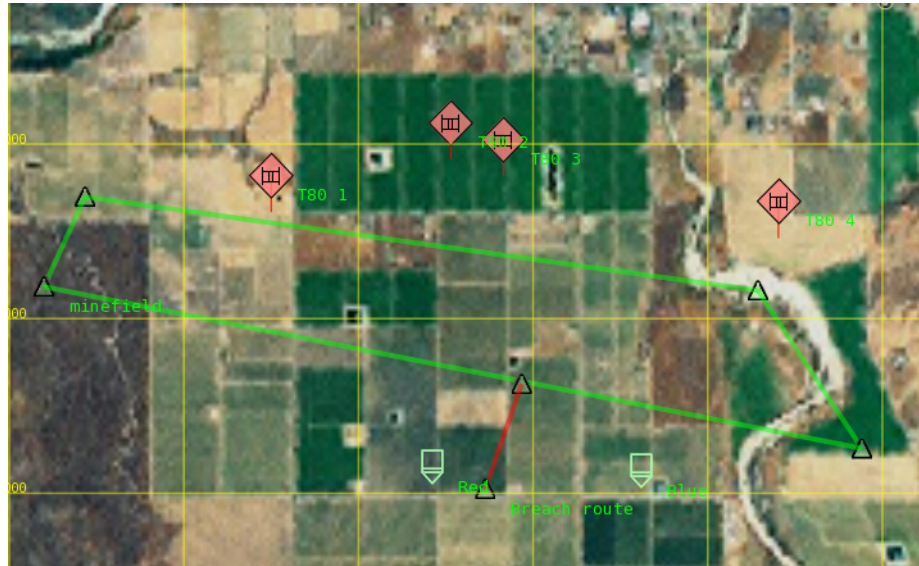
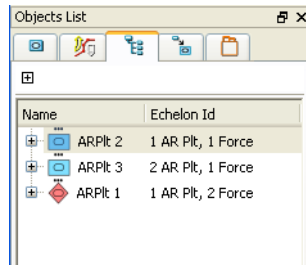


Figure A-7. Breaching scenario progress

A.1.5. Create the Friendly Entities

Using [Figure A-1](#) as a guide to location, create the friendly entities. We will create one platoon from individual entities, and the other two using pre-configured platoons.

1. Click the Entity Palette (on the right margin of the window).
2. In the Categories drop-down list, select Aggregate.
3. In the Force drop-down list, select Friendly.
4. In the list of entities displayed, select Armor Plt(US).
5. Click on the map to place the red platoon and blue platoon as shown in [Figure A-1](#). Right-click to exit create mode. The aggregates are created with default names (ARPlt 2 and ARPlt 3). They are disaggregated and expanded, so you can see the individual entities.
6. Select one of the platoons. To select a platoon, you must select the platoon icon, not one of its subordinates. The easiest place to do that is on the Echelon View tab of the Object Lists panel ([Figure A-8](#)).



Name	Echelon Id
ARPlt 2	1 AR Plt, 1 Force
ARPlt 3	2 AR Plt, 1 Force
ARPlt 1	1 AR Plt, 2 Force

Figure A-8. Echelon View tab

7. Choose **Entities** → **Edit**. The Edit Armor Plt (US) dialog box opens.
8. In the name text box, replace the default name with Red Plt or Blue Plt, depending on which platoon you selected.
9. Click Update.
10. Rename the other platoon that you created.
11. Click the Entity Palette.
12. In the Categories drop-down list, select Ground.
13. In the list of entities, click M1A2 Tank. The cursor changes to draw mode.
14. Click on the map where White Platoon should be. An entity icon is displayed.
15. Click three more times to create the rest of the tanks in White Platoon. Right-click to exit create mode. (We will create the aggregate from these entities in the next section.)
16. Open the Entity Palette.
17. In the Ground/Friendly category, select M58 MICLIC.
18. Click twice on the map to the South of Red Plt to create two MICLIC entities.
19. Right-click to exit create mode.
20. Save the scenario.

Create White Platoon

1. Select the four members of White Platoon.
2. Choose **Entities** → **Aggregates As**. The Aggregate As dialog box opens.
3. Select Armor Plt(US) from the list.
4. Click OK.
5. Select the new platoon.
6. Choose **Entities** → **Edit**. The Edit Armor Plt (US) dialog box opens.
7. Change the name to White Plt. (HLA limits the length of aggregate names to 10 characters. If you make the name longer than this, for example, White Platoon, when VR-Forces loads the scenario, it will rename the platoon to something like Plt 1.)
8. Save the scenario.

A.1.6. Write the Plans

The plans tell the entities how to carry out their roles in the scenario. The White platoon just stays in place. We do not give it a plan. It will just respond to any Opposing Force entities that it detects.

Write the Plan for Blue Platoon

Blue Platoon will move to a waypoint. As it moves it responds to any Opposing Force entities that it detects. The plan is quite simple to write.

To write the plan for Blue Platoon:

1. Select Blue Platoon.
2. Choose **Entities** → **Plan**. The Plan window opens ([Figure A-9](#)).

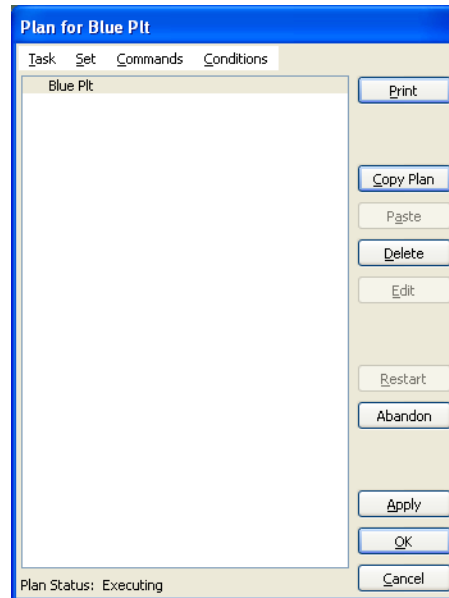


Figure A-9. Blue Platoon plan

3. In the Plan window, choose **Task** → **Move To Waypoint**. The Move To dialog box opens (Figure A-10).

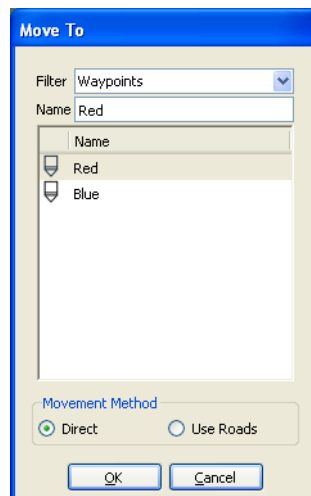


Figure A-10. Move To dialog box

4. In the Move To dialog box, or on the map, select the Blue waypoint.
5. Click OK. The task is added to the plan. The plan is now complete (Figure A-11).

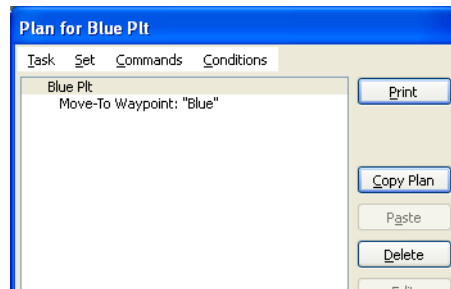


Figure A-11. Blue plan - complete

6. In the Plan window, click OK.

Write the Plan for Red Platoon

The Red Platoon moves to the Red waypoint. It has another job to do. When all the opposing forces are destroyed, it sends a message on the radio network. The MICLICs are listening for the message. They will not try to clear the minefield until they receive it.

1. Select Red Platoon.
2. Press **p**. The Plan window opens.
3. In the Plan window, choose **Task** → **Move To Waypoint**. The Move To dialog box opens (Figure A-10).
4. In the Move To dialog box, or on the map, select the Red waypoint.
5. Click OK. The task is added to the plan (Figure A-12).

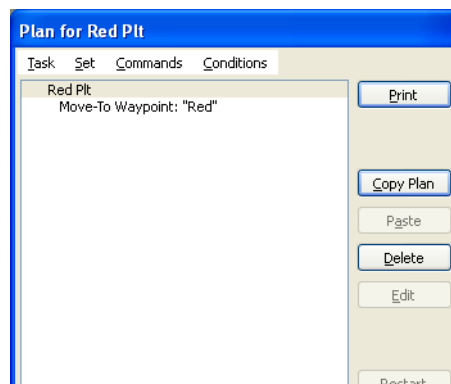


Figure A-12. Plan for Red Platoon - move to waypoint

6. Select the top line in the plan.
7. In the Plan window, choose **Conditions** → **When**. The When Expression dialog box opens (Figure A-13).

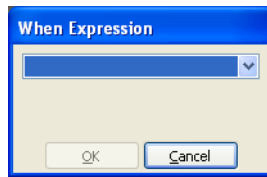


Figure A-13. When Expression dialog box

8. In the drop-down list, select Entity Destroyed. The Entity Destroyed dialog box opens.
9. In the list of entities, select ArPlt 1 (Figure A-14).

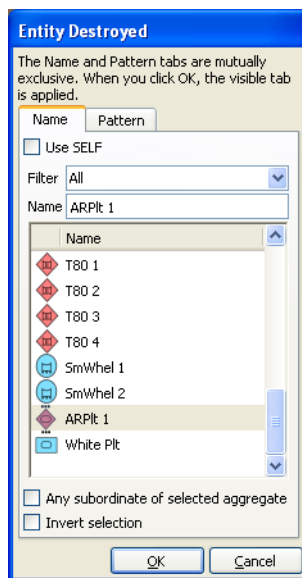


Figure A-14. Entity Destroyed dialog box

10. Click OK. The expression is added to the When Expression dialog box (Figure A-15).

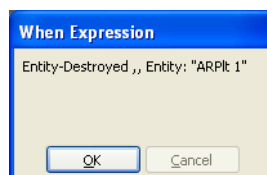


Figure A-15. Completed When Expression dialog box

11. In the When Expression dialog box, click OK. The When expression is added to the plan (Figure A-16). Now we need to add tasks to execute when the expression becomes true.

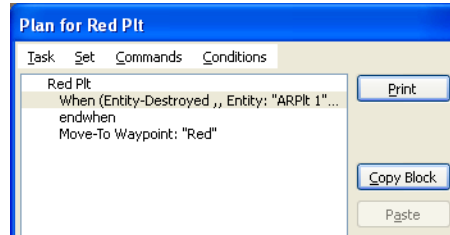


Figure A-16. Red Plan with incomplete When expression

12. The When expression should be selected. If not, select it.
13. Choose **Task** → **Send Text Message**. The Send Text dialog box opens.
14. In the Send Text dialog box, select the Broadcast check box. This means the message will be sent to all entities.
15. In the Message Text box, type Opposing Force Destroyed. The dialog box looks like Figure A-17.

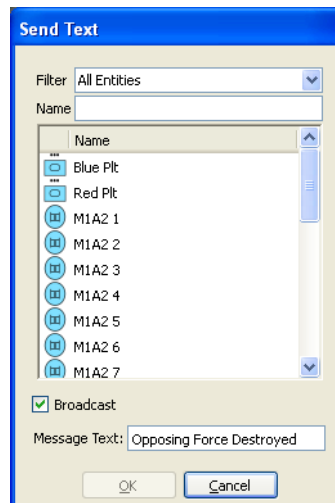


Figure A-17. Send Text dialog box

16. Click OK. The plan for Red Platoon is finished (Figure A-18).

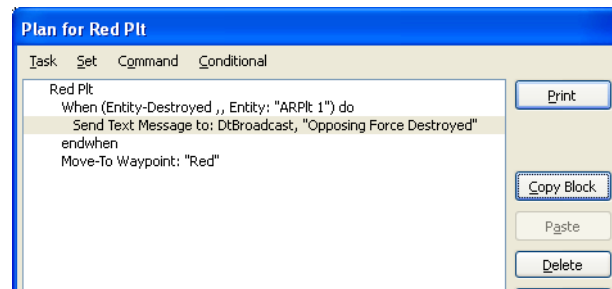


Figure A-18. Completed plan for Red Platoon

17. Click OK.
18. Save the scenario.

Write the Plans for the Engineering Units

We want the MICLICs to follow Red Platoon at a distance. When they are notified that the opposing force has been destroyed, they move along a route to the edge of the minefield. Then they clear it.

The MICLICs provided with VR-Forces do not actually have the ability to simulate clearing a minefield. We are going to provide some visual interest by using global commands to remove the original minefield and replace it with two minefields with a space between them.

We will start with the plan for SmWhel 1.

1. Select SmWhel 1.
2. Press **p**. The Plan window opens.
3. In the Plan window, choose **Conditions** → **When**. The When Expression dialog box opens.
4. In the list, select Receive Text Message. The Receive Text Message dialog box opens.
5. Type the message that we are waiting for (Opposing Force Destroyed) ([Figure A-19](#)).

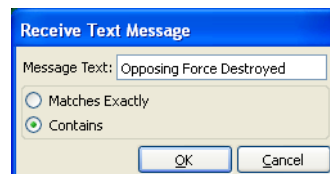


Figure A-19. Receive Text Message dialog box

6. Click OK.

7. In When Expression dialog box, click OK. The empty expression is added to the plan window (Figure A-20). Now we need to tell the entity what to do when it gets this message (move along the route, then redraw the minefield).

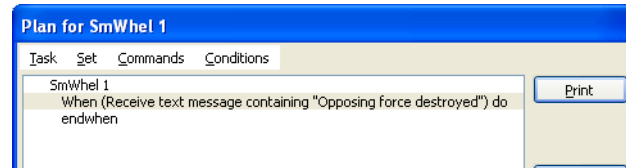


Figure A-20. Plan for SmWhel 1

8. In the Plan window, choose **Task** → **Move Along Route**. The Move Along Route dialog box opens.
9. Select breach route, then click OK. The task is added to the plan.
As we said earlier, VR-Forces does not actually model minefields or the types of entities that could clear one. To provide the visual illusion of clearing a corridor through the minefield, after the MICLICs arrive at the end of the route, we will delete the minefield and create two new minefields that occupy most of the space of the original one, but leaves a corridor for entities to travel through.
10. Choose **Commands** → **Delete**. The Delete dialog box opens.
11. In the list, select Minefield.
12. Click OK.
13. Choose **Commands** → **Create** → **Obstacle**. (You create obstacles the same way you create areas.) The Create Obstacle dialog box opens.
14. Type Minefield-left in the Name box.
15. Draw an area over most of the minefield to the left of where the breach route intersects the minefield.
16. Click OK. You will not see this new area, because it does not exist in the simulation yet. It will not exist until such time as the command gets executed.
17. Repeat steps 13 through 16, but this time draw the minefield to the right of the route. Call it Minefield-right. The plan should now be similar to Figure A-21.

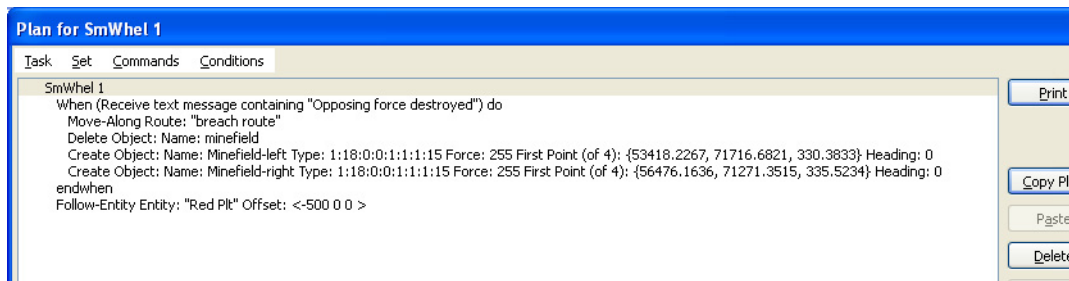


Figure A-21. Plan for SmWhel 1 after When expression complete

18. We will finish the plan by having the entity follow Red Platoon. Select the last line of the When block (endwhen).
19. Choose **Task** → **Follow Entity**. The Follow Entity dialog box opens.
20. In the list, select Red Plt.
21. In the Behind box, type 500. The dialog box should look like [Figure A-22](#).

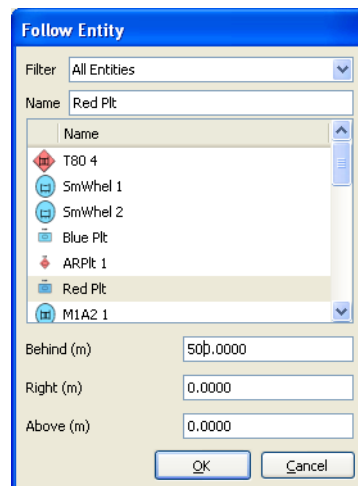


Figure A-22. Follow Entity dialog box

22. Click OK. The plan is now complete (Figure A-23).



Figure A-23. Complete plan for SmWhel 1

23. Click OK.

24. Save the scenario.

Write the Plan for SmWhel2 2

The plan for SmWhel 2 is a bit simpler than that of SmWhel 1. It follows SmWhel 1. When it receives the message that the opposing force is destroyed, it continues to follow SmWhel 1, but instead of following behind it, it moves parallel, so that it arrives at the minefield next to the other entity. Try creating the plan yourself. It should look like (Figure A-24).

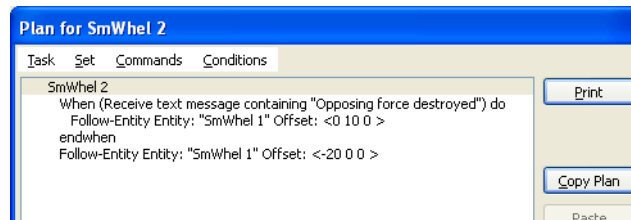


Figure A-24. Plan for SmWhel 2

A.1.7. Save the Scenario

Be sure to save the scenario before you run the simulation. If you want to save it in its starting state, do not save it after you run the simulation.

A.1.8. Running the Scenario

Once you have created the scenario and saved it, click the Run button and watch the simulation run. Open the plan windows for the MICLICs and observe the progression of tasks through the plan.

If hostile entities do not get destroyed, it may be that the blue entities cannot see them. If they cannot see them, they cannot shoot each other. Use the intervisibility feature to test line-of-sight. Move the entities around, or find a flatter section of the terrain until you get the results you want.

You can run the breaching scenario included with VR-Forces and see how it compares to the one that you created.

Figure A-25 shows the breaching scenario after the MICLICs have completed their plans. All of the aggregates are expanded so that you can see the individual entities.

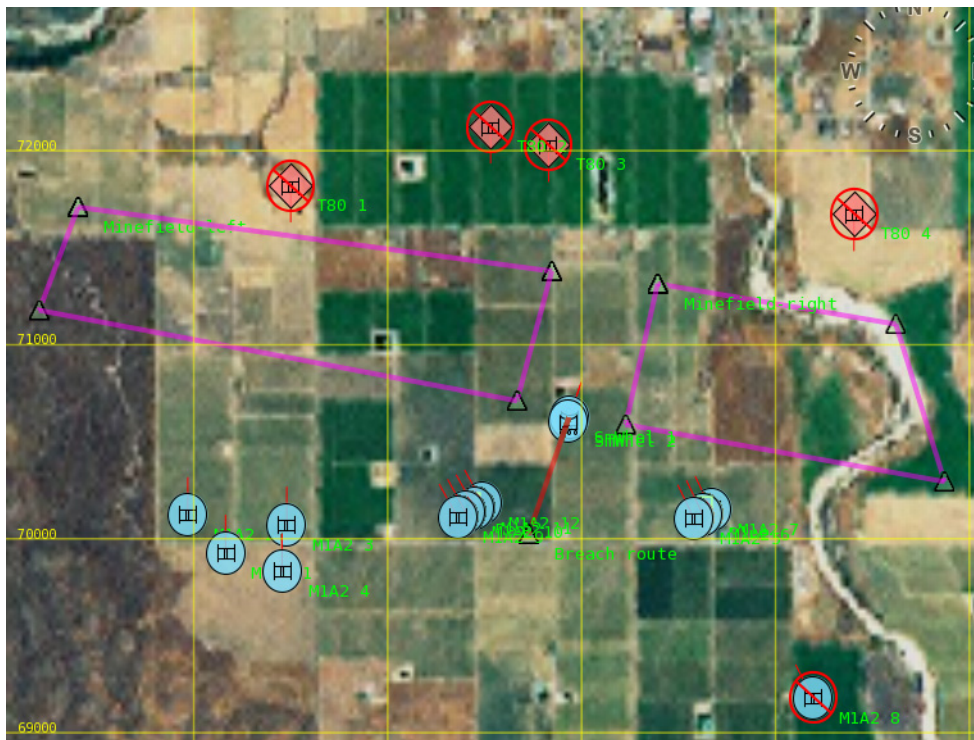


Figure A-25. Breaching scenario after minefield cleared

A.2. The Embarkexample Scenario

The embarkexample scenario (Figure A-26) demonstrates the embarkation feature. It shows the following:

- Embarking and disembarking DIs to and from a Bradley vehicle
- Embarking and disembarking a helicopter to and from a Harpers Ferry ship and an aircraft carrier
- Embarking a fixed-wing aircraft on the aircraft carrier
- Embarking DIs onto a helicopter and disembarking one of them onto the aircraft carrier
- Directly embarking a DI on an aircraft carrier and walking on the flight deck.

The scenario uses immediate embarkation and the embark and disembark tasks. It also demonstrates various types of conditional statements, including nested conditional statements.

A completed scenario is included with VR-Forces in `./data/scenarios/embarkexample`. This section is a step-by-step explanation of how to create the scenario. It assumes that you have completed the breaching scenario example and does not provide quite as much detail for how to create entities and tactical graphics.



If you are using HLA, you must use RPR FOM 2 draft 17 for scenarios that use embarkation.



Figure A-26. Embark scenario

A.2.1. Create the Entities and Objects

The scenario has the following entities:

- A fixed-wing aircraft on the airport runway
- A helicopter embarked on an LSD-49 Harpers Ferry ship
- A dismounted infantry entity (DI) embarked on an aircraft carrier
- A DI standing behind a Bradley vehicle in the town
- A DI standing in the courtyard of the palace.

The scenario has the following tactical graphics:

- A route for the fixed-wing plane to follow to take off
- A waypoint in front of the palace for the Bradley vehicle to drive to
- A waypoint in front of the palace for the helicopter to land at
- A waypoint on the carrier deck for the DI to walk to.

Create the Surface Entities

1. Start VR-Forces.
2. Choose **File** → **New Scenario**. The Choose Simulation Terrain dialog box opens.
3. Select *Makland.mtf*.
4. Click Open. The New Scenario dialog box opens.
5. Click OK. The Makland database is displayed.
6. Press **q** to zoom out so you can see the Makland peninsula, the bay and the airport.
7. On the Entity Palette, select the Surface category and the Friendly force.
8. In the entity list, select CVN-75 Harry S. Truman
9. Click in Makland Bay midway to the left of the peninsula.
10. Right click to exit create entity mode.
11. Place a LSD- 49 Harpers Ferry Class Ship in the middle of Makland Bay.



Figure A-27. Surface entities

12. Save the scenario.

Create the Aircraft

1. Zoom in on the airport, located in the Northeast quadrant of the terrain.
2. On the Entity Palette, select the Fixed Wing category.
3. Select an F/A 18 Hornet entity.
4. Click the northern end of the North/South runway.
5. Right-click to exit create entity mode.
6. Select the entity.
7. Choose **Set** → **Heading**. The Set Heading dialog box opens.
8. Type 180 and click OK.
9. Zoom out to see a larger area of the map.
10. On the Entity Palette, select the Rotary Wing category.
11. Select a CH46E Sea Knight entity.
12. Click anyplace on the map.
13. Right-click to exit create mode.
14. Select the helicopter.
15. Choose **Entities** → **Embark On**. The Embark On dialog box opens.
16. In the list window, select the LSD 49 (Harper 1).
17. Click OK. The helicopter is immediately embarked on the LSD 49. If you select the Embarkation View on the Objects tab of the Utility toolbar, you can see that the helicopter is listed as being embarked on the LSD 49 ([Figure A-28](#)).



Figure A-28. Helicopter embarked on LSD 49 Harpers Ferry

18. Save the scenario.

Create the Bradley Vehicle

1. Zoom in on the town on the peninsula.
2. On the Entity Palette, change the category to Ground.
3. Select an M2A2 Bradley IFV entity.
4. Place the Bradley vehicle where the road to the palace intersects a North/South street, as shown in [Figure A-29](#).



Figure A-29. Bradley vehicle

5. Save the scenario.

Create Dismounted Infantry

The scenario has two dismounted infantry that ride in the helicopter, and one that is embarked on the aircraft carrier. Embarking the DI on the carrier requires a bit of discussion.

There are two ways to embark an entity – immediate embarkation and the embarkation task. If you want to use the Embark task, the receiving entity must be configured to accept the embarking entity. We will use the Embark task a little later in this example.

We want to embark one of the DI entities on the aircraft carrier. However, aircraft carriers are not configured to accept DI entities, so we cannot use an Embark task to do this. However, we can use the immediate embark feature to embark an entity on any other entity. To do this, we must specify the coordinates at which to place the entity. In this example, we want to place a DI on the carrier deck and make it look good in the 3D view. Through experimentation, we know that using the model supplied with VR-Forces, the Z offset to place an entity on the carrier deck is 31 meters. We also offset the X value to move the entity to the side of the deck.

1. On the Entity Palette, change the category to Lifeform.
2. Select a Dismounted-Infantry entity.
3. Place one DI directly behind (south of) the Bradley vehicle.
4. Place one DI in the courtyard area of the palace at the top of the hill in Makland (Figure A-30).



Figure A-30. DI at palace

5. Place a third DI anyplace in town. This is just a temporary location. In a moment you will embark this entity on the aircraft carrier.
6. Double-click the DI in the palace to make its position editable. Hold down the Shift key and drag the mouse to change the heading indicator to 270 degrees (Figure A-31).



Figure A-31. DI at palace after setting heading

7. Select the DI that you placed temporarily in town.
8. Choose **Entities** → **Embark On**. The Embark On dialog box opens.
9. In the entity list, select the carrier.
10. Select the Override Position option.
11. In the Position Override group box, set the X value to 15 and the Z value to 31.
This places the DI at the deck level of the carrier (Figure A-32).

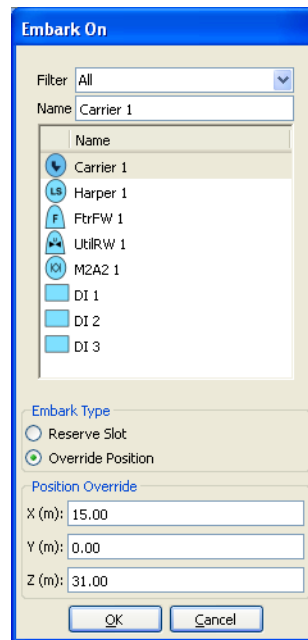


Figure A-32. Embark On dialog box

12. Click OK. The DI is embarked on the carrier.
13. Save the scenario.

Create the Tactical Graphics

We need a few tactical graphics to specify the movement tasks for the entities.

Create a Runway at the Airport

At the airport, create a route from North to South along the runway. Call it Runway.



Figure A-33. Runway

Create Waypoints at the Palace

1. Zoom in on the palace at the top of the hill near the town.
2. Place a waypoint on the edge of the road just before the palace entryway. Call it Palace.
3. Place a waypoint on the ground in front of the palace between the trees. Call it Helipad (Figure A-34).



Figure A-34. DI and waypoints at palace

Attach a Waypoint to the Carrier

We want to attach a waypoint to the carrier. However, in the 2D view, there is no way to figure out where to place the waypoint because the carrier is shown as a 2D icon. So, we will switch to the 3D view.

1. Move the observer so that you are looking at the 2D icon for the aircraft carrier.
2. Check the Attachment icon () on the Attach Object toolbar to make sure that you are not attached to an entity. If it is depressed, click it to unattach the observer.
3. In the Observer list on the Observer toolbar, select Stealth. The view changes to 3D. However we are still looking down on the terrain, so we have a nice top-down view of the aircraft carrier ([Figure A-35](#)).



Figure A-35. Aerial view of carrier in 3D

4. Zoom in on the aircraft carrier.
5. Choose **Create** → **Waypoint**.
6. Expand the Create Waypoint dialog box.
7. Clear the Attach Object to Mouse check box.
8. Type a name for the waypoint, such as Carrier.
9. In the Altitude group box, select Above Sea Level.
10. Type a value of 31 (to put the waypoint on the carrier deck).
11. Select the Attach Object to Mouse check box.
12. Click on the deck of the carrier toward the lower right ([Figure A-36](#)).

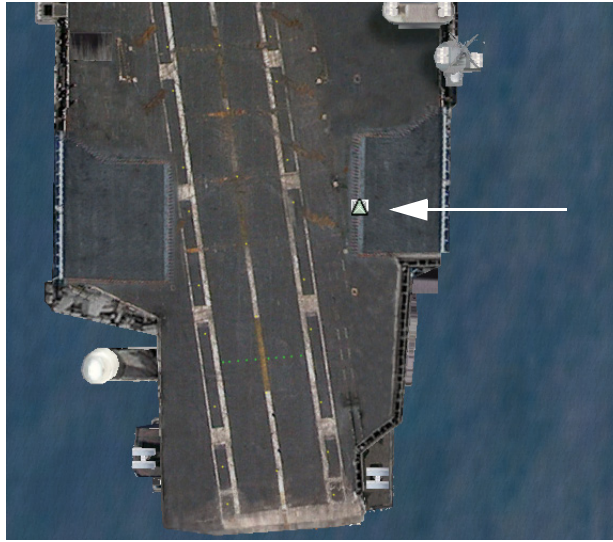


Figure A-36. Waypoint on carrier

13. Right-click.

Now we will attach the waypoint to the aircraft carrier. When you attach a tactical graphic to an entity, it moves with the entity. Even though the aircraft carrier is not moving in this scenario, this extra step will teach you about this procedure.

14. Select the waypoint.

15. Choose **Entities** → **Attach Object To**. The Attach Object To dialog box opens.

16. Select Carrier 1.

17. Save the scenario.

A.2.2. Write the Plans for the Entities

We need to write plans for the entities to do the following:

- ♦ The jet will take off from the airport and embark on the carrier (land and taxi to a parking place).
- ♦ The helicopter will disembark from the LSD-49 and fly to the palace, where it will land. Two DIs will embark on it. Then it will take off and embark on the carrier, disembark, and embark back on the LSD-49.
- ♦ The DI in town will embark on the Bradley and ride with it to the palace. It will then disembark from the Bradley and embark on the helicopter.
- ♦ The DI in the palace courtyard will embark on the helicopter.
- ♦ The DI on the carrier will walk to the waypoint.

Write the Fixed-Wing Aircraft's Plan

1. Select the fixed-wing entity.
2. Choose **Entities** → **Plan**. The Plan window opens.
3. In the Plan window, choose **Task** → **Fixed Wing Takeoff**. The Fixed Wing Takeoff dialog box opens.
4. In the Fixed Wing Takeoff dialog box, select Runway from the list of routes.
5. Click OK. The task is added to the plan.
6. Choose **Task** → **Embark**. The Embark On dialog box opens.
7. In the Embark On dialog box, select Carrier 1 from the list and click OK ([Figure A-37](#)).

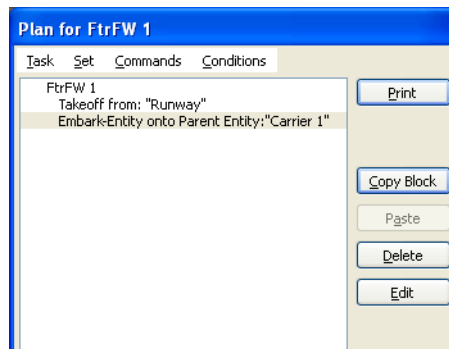


Figure A-37. Fixed-wing entity plan

8. In the Plan window, click OK. The plan for the fixed-wing entity is finished.

Write the Helicopter's Plan

1. If you are in the 2D view, on the Objects List Panel, Entity List view, select the helicopter entity. (Since the helicopter is embarked, it is not visible on the map, so you cannot select it there.) If you are in the 3D view, you can select the copter in the Objects List Panel or by clicking the model.
2. Choose **Entities** → **Plan**. The Plan window opens.
3. Choose **Task** → **Disembark**.
4. Choose **Task** → **Move To Altitude**. The helicopter is going to fly to the palace, which is on top of a hill with steep cliffs. Sometimes the terrain following feature of the helicopter cannot handle steep cliffs well, causing the helicopter to crash, so we want to get it up to a good altitude to avoid crashing.
5. Set the altitude to 200 meters and click OK.
6. Choose **Task** → **Rotary Wing Land**. The Rotary Wing Landing dialog box opens.

7. In the list of waypoints, select Helipad and click OK.
When the helicopter lands, it sends a message to the DIs to tell them that it is OK to embark.
8. Choose **Task** → **Send Text Message**. The Send Text dialog box opens.
9. Select DI 1. This will direct the message just to this entity.
10. In the Message Text box, type Load up.
11. Click OK. When the helicopter lands, it will tell DI 1 to load up, so that it knows it is time to embark on the helicopter.
After the helicopter lands at the palace, it needs to wait until the two DI have embarked before it takes off. So we use a When statement with an Entity Embarked condition. The helicopter doesn't need to watch for this entity to be embarked until it lands at the palace, so we can put the When statement in the middle of the plan rather than at the beginning as we might with other conditions.
12. Choose **Conditions** → **When**. The When Expression dialog box opens.
13. Select Entity Embarked. The Entity Embarked dialog box opens.
14. On the Name tab, in the top list, select DI 2. This is the entity whose embarkation status we want the helicopter to monitor.
15. In the bottom list, select UtilRW1. This is the name of the helicopter. We want to test the condition that DI 2 is embarked on UtilRW 1.
16. In the Entity Embarked dialog box, click OK. Then, click OK in the When Expression dialog box. The condition is added to the plan. Now we need to specify what the helicopter should do when the condition is true.
17. The line in the plan window that starts "When (Entity-Embarked)" should already be selected. If it is not, select it now.
18. In the Plan window, choose **Task** → **Embark**.
19. Specify that the helicopter embark on Carrier 1.
20. In the Plan window, choose **Task** → **Wait Duration**.
21. Specify a duration of 1 minute. This is how long the helicopter will wait on the carrier deck after it embarks.
22. In the Plan window, choose **Task** → **Disembark**. This disembarks the helicopter from the carrier.
23. In the Plan window, choose **Task** → **Embark**.
24. Specify that the helicopter is to embark on the LSD-49 Harpers Ferry.
25. The plan is complete ([Figure A-38](#)), so click OK.

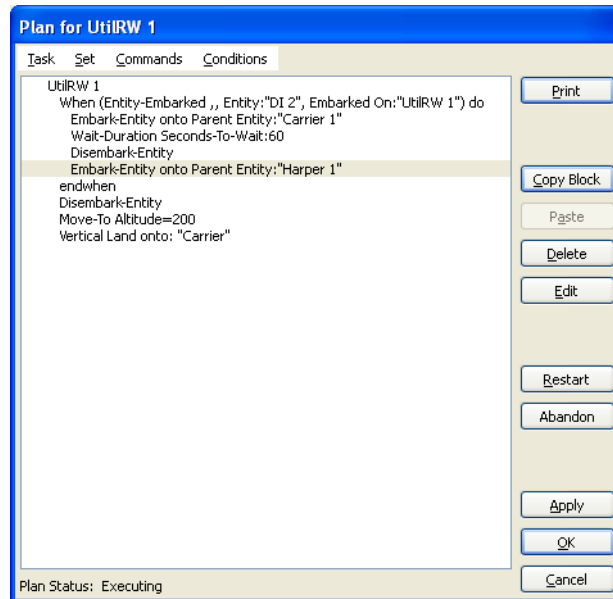


Figure A-38. Rotary-wing entity plan

Write the Plan for the DI on the Carrier

By now you should have a pretty good feel for the mechanics of adding tasks to a plan, so we will just tell you which tasks to add to the plans for the DI entities. To view the plans for the entities, load the supplied example scenario and open the Plan window for the entity you are interested in.

Give the DI on the carrier a task to move to Waypoint "carrier".

Write the Plan for the DI in Town

1. Task this entity to embark on the Bradley vehicle.
We want the DI to get out of the Bradley when it reaches the palace waypoint. There is no test for arriving at a waypoint, so we have two options. We can create an area around the waypoint and test for Entity In Area, or we can figure out how long it takes the Bradley to drive to the waypoint and have the DI wait that long before doing anything. For this scenario, we use the simulation time test.
2. Select the top line in the plan window. (The line that says *entity_name*.) We want this condition to be at the top of the plan so it gets registered immediately because we do not know when it will come true.
3. Choose **Conditions** → **When**.
4. In the When Expression list, select Sim Time>. The Simulation Time Expression dialog box opens.
5. Select > (greater than) from the drop-down list.
6. Specify a simulation time of 1 minute, 40 seconds.
7. Click OK to exit the dialog boxes for the condition.
8. In the When block, add a Disembark task.
9. After the Disembark task, add a task to embark on the helicopter.
10. Add another When condition. Select the Entity Embarked condition and specify the helicopter embarked on the carrier.
11. In the When block, add a Wait Duration, 30 seconds task. This task means that when the helicopter embarks on the carrier, the DI entity waits 30 seconds.
12. Add a Disembark task. This disembarks the DI from the helicopter. Since the helicopter is embarked on the carrier, the DI is automatically embarked on the carrier.
13. Add a Move To task and specify Waypoint “carrier”. After the DI disembarks from the helicopter, it walks across the deck to the waypoint.
14. Save the plan.

Write the Plan for the DI in the Courtyard

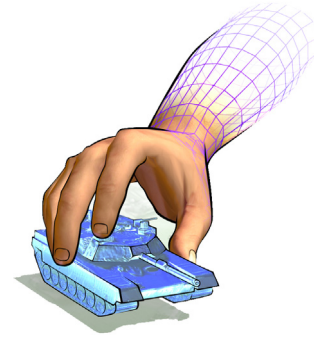
The DI in the courtyard (DI 2) waits until DI 1 embarks on the helicopter, then DI 2 embarks.

1. Open the Plan window for DI 2.
2. Add a When condition that tests for DI 1 being embarked on the helicopter.
3. In the When block, add an Embark task for DI 2 to embark on the helicopter.
4. Save the plan.

Write the Bradley's Plan

We want the Bradley to wait until DI 1 embarks on it, then drive to the palace.

1. Add a When statement that tests for DI 1 being embarked on the Bradley.
2. Within the When block, add a Move To task for the Bradley to move to Waypoint “palace”. In the Move To dialog box, select Use Roads, so that the Bradley will drive along the road, rather than directly up the hill.
3. Save the plan.



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Link - Simulate - Visualize

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