



# VR-Engage

---

Users Guide



**VT MAK**  
A company of VT Systems





# VR-Engage

---

Users Guide

Version 1.1

Copyright © 2017 VT MAK  
All rights Reserved. Printed in the United States.

Under copyright laws, no part of this document may be copied or reproduced in any form without prior written consent of VT MAK.

VR-Exchange™, VR-TheWorld™, and VR-Vantage™ are trademarks of VT MAK. MAK Technologies®, VR-Forces®, RTIsPy®, B-HAVE®, and VR-Link® are registered trademarks of VT MAK.

DI-Guy™ is a trademark of Boston Dynamics.

GL Studio® is a registered trademark of The DiSTI® Corporation.

Portions of this software use SpeedTree® RT technology (©2008 Interactive Data Visualization, Inc.). SpeedTree® is a registered trademark of Interactive Data Visualization, Inc. All rights reserved.

SilverLining™ is a trademark of Sundog Software.

All other trademarks are owned by their respective companies.

VT MAK  
150 Cambridge Park Drive, 3rd Floor  
Cambridge, MA 02140 USA

Voice: 617-876-8085  
Fax: 617-876-9208

[info@mak.com](mailto:info@mak.com)  
[www.mak.com](http://www.mak.com)

Revision VRN-1.1-1-170809



# Contents

## Preface

---

|                                      |      |
|--------------------------------------|------|
| How the Manual Is Organized .....    | vii  |
| Documentation Set .....              | viii |
| MAK Products .....                   | viii |
| How to Contact Us .....              | xi   |
| Document Conventions .....           | xii  |
| Mouse Button Naming Conventions..... | xiii |
| Third Party Licenses .....           | xiii |
| Boost License.....                   | xiii |
| libXML and libICONV .....            | xiv  |
| Freefont OpenType Font Set.....      | xiv  |
| osgoculusviewer Library.....         | xiv  |
| NVIDIA.....                          | xv   |

## Chapter 1. Introduction to VR-Engage

---

|                                                            |     |
|------------------------------------------------------------|-----|
| 1.1. VR-Engage Features .....                              | 1-2 |
| 1.1.1. VR-Engage Versions .....                            | 1-2 |
| 1.1.2. Simulation (Role-Playing) Capabilities .....        | 1-2 |
| 1.1.3. User Interface .....                                | 1-6 |
| 1.1.4. Image Generator .....                               | 1-7 |
| 1.1.5. Terrain .....                                       | 1-7 |
| 1.2. Integration with VR-Forces .....                      | 1-8 |
| 1.3. Integration with Other MAK Products .....             | 1-8 |
| 1.3.1. After Action Review – Using MAK Data Logger .....   | 1-8 |
| 1.3.2. Network Interoperability with Other Federates ..... | 1-8 |
| 1.4. Extensibility .....                                   | 1-9 |
| 1.5. Licensing .....                                       | 1-9 |
| 1.5.1. Vortex License (for Ground Vehicle Dynamics) .....  | 1-9 |
| 1.5.2. RTDynamics License (For Aircraft) .....             | 1-9 |

|                                                                   |      |
|-------------------------------------------------------------------|------|
| 1.5.3. License Requirements for Hosting a VR-Forces Session ..... | 1-10 |
|-------------------------------------------------------------------|------|

---

**Chapter 2. Installing VR-Engage**

---

|                                                              |     |
|--------------------------------------------------------------|-----|
| 2.1. Installing VR-Engage .....                              | 2-2 |
| 2.1.1. Installing VR-Engage on Windows .....                 | 2-2 |
| 2.2. The VR-Engage Directory Structure .....                 | 2-4 |
| 2.3. Installing and Setting Up the MAK License Manager ..... | 2-5 |
| 2.3.1. Specifying the License Server .....                   | 2-6 |
| 2.4. Installing an RTI .....                                 | 2-8 |
| 2.4.1. Installing the MAK RTI .....                          | 2-8 |

---

**Chapter 3. Starting VR-Engage**

---

|                                                           |      |
|-----------------------------------------------------------|------|
| 3.1. Starting VR-Engage .....                             | 3-2  |
| 3.1.1. Hosting a VR-Forces Session .....                  | 3-2  |
| 3.1.2. Starting an Unhosted Session .....                 | 3-4  |
| 3.2. Choosing a Role .....                                | 3-5  |
| 3.3. Connecting to VR-Forces .....                        | 3-8  |
| 3.4. Changing Your Role .....                             | 3-8  |
| 3.4.1. Changing Your Role in the Change Role Panel .....  | 3-8  |
| 3.4.2. Changing Your Role by Embarking on a Vehicle ..... | 3-9  |
| 3.5. Starting a New Session .....                         | 3-10 |
| 3.6. Setting Up the Simulation Connection .....           | 3-10 |
| 3.7. Creating a Startup Configuration .....               | 3-12 |
| 3.8. Playing in Windowed Mode .....                       | 3-13 |

---

**Chapter 4. Controlling People and Ground Vehicles**

---

|                                                          |      |
|----------------------------------------------------------|------|
| 4.1. Introduction .....                                  | 4-3  |
| 4.2. Moving Your Character Around the Terrain .....      | 4-3  |
| 4.3. Displaying the Action Menu .....                    | 4-3  |
| 4.4. Choosing a Weapon .....                             | 4-4  |
| 4.5. Firing a Weapon .....                               | 4-4  |
| 4.6. Embarking on a Vehicle .....                        | 4-5  |
| 4.7. Disembarking from a Vehicle .....                   | 4-5  |
| 4.8. Parachuting .....                                   | 4-6  |
| 4.9. Tasking Other Entities .....                        | 4-6  |
| 4.9.1. Disembark Entity .....                            | 4-7  |
| 4.9.2. Follow Me .....                                   | 4-7  |
| 4.9.3. Move to Location .....                            | 4-8  |
| 4.9.4. Move to My Location .....                         | 4-8  |
| 4.9.5. Suppress Location .....                           | 4-9  |
| 4.10. Using the Radio .....                              | 4-10 |
| 4.11. Turning on Your Flashlight .....                   | 4-10 |
| 4.12. Changing Visual Sensors .....                      | 4-11 |
| 4.12.1. Changing the Sensor for an LAV Crew Member ..... | 4-11 |
| 4.13. Using the Binoculars .....                         | 4-11 |
| 4.14. Opening and Closing Doors and Windows .....        | 4-12 |

|                                                                |      |
|----------------------------------------------------------------|------|
| 4.15. Operating the LAV and M1A2 .....                         | 4-12 |
| 4.15.1. Using the Intercom .....                               | 4-13 |
| 4.15.2. The Gunner Role .....                                  | 4-13 |
| 4.15.3. Commanding the LAV .....                               | 4-13 |
| 4.15.4. Driving the LAV and M1A2 .....                         | 4-13 |
| 4.16. Driving Cars and Trucks .....                            | 4-15 |
| 4.17. Pivoting a Tank .....                                    | 4-15 |
| 4.18. Changing the View Mode .....                             | 4-16 |
| 4.19. Resetting Humans and Ground Vehicles .....               | 4-16 |
| 4.20. Starting VR-Forces Events .....                          | 4-17 |
| 4.21. Support for the Oculus Rift HMD .....                    | 4-18 |
| 4.21.1. Disabling Instancing .....                             | 4-18 |
| 4.22. Configuring Ground Vehicles on Geocentric Terrains ..... | 4-19 |

## **Chapter 5. Controlling Aircraft**

|                                                      |      |
|------------------------------------------------------|------|
| 5.1. Introduction .....                              | 5-2  |
| 5.1.1. The Head-Up Display .....                     | 5-3  |
| 5.1.2. The Instrument Panel .....                    | 5-3  |
| 5.1.3. Aircraft Display Options .....                | 5-6  |
| 5.2. Taking Control of an Aircraft .....             | 5-6  |
| 5.3. Bombing Targets .....                           | 5-7  |
| 5.3.1. Targeting a Bomb Using a Laser Code .....     | 5-7  |
| 5.4. Air-to-Air Combat .....                         | 5-8  |
| 5.5. Resetting Aircraft .....                        | 5-10 |
| 5.6. Requesting SAR Images from RadarFX Server ..... | 5-10 |
| 5.6.1. Requesting a SAR Image .....                  | 5-11 |
| 5.6.2. Configuring a SAR Request .....               | 5-11 |
| 5.7. Configuring Additional Aircraft .....           | 5-16 |

## **Chapter 6. Mouse, Keypad, and Controller Mappings**

|                                                                              |      |
|------------------------------------------------------------------------------|------|
| 6.1. Mouse and Keyboard Mappings .....                                       | 6-2  |
| 6.1.1. Enabling and Disabling Mouse Control .....                            | 6-3  |
| 6.2. Logitech Gamepad Mappings for Human Control .....                       | 6-4  |
| 6.3. Logitech Gamepad Mappings for Using the Action Menu .....               | 6-5  |
| 6.4. Logitech Gamepad Mappings for the LAV and M1A2 .....                    | 6-6  |
| 6.5. G27 Racing Wheel Controller .....                                       | 6-8  |
| 6.6. Logitech Gamepad Mappings for Cars and Trucks .....                     | 6-9  |
| 6.7. Flight Controllers .....                                                | 6-10 |
| 6.7.1. Thrustmaster HOTAS Warthog Mappings for<br>Fixed-Wing Entities .....  | 6-10 |
| 6.7.2. Thrustmaster HOTAS Warthog Mappings for<br>Rotary-Wing Entities ..... | 6-13 |
| 6.7.3. T.Flight Hotas X Mappings for Fixed-Wing Entities .....               | 6-15 |
| 6.7.4. T.Flight Hotas X Mappings for Rotary-Wing Entities .....              | 6-18 |
| 6.7.5. Gamepad Flight Control Mappings for Fixed-Wing Entities .....         | 6-21 |

## Contents

---

|                                                                          |      |
|--------------------------------------------------------------------------|------|
| 6.7.6. Gamepad Flight Control Mappings for<br>Rotary-Wing Entities ..... | 6-23 |
| 6.8. Generic Gamepad Button Numbering .....                              | 6-24 |
| 6.9. Configuring Joysticks and Keyboard Control .....                    | 6-25 |
| 6.9.1. Creating a Joystick Configuration .....                           | 6-25 |
| 6.9.2. Mapping the Joystick Stick .....                                  | 6-27 |
| 6.9.3. Mapping Joystick Buttons and Keyboard Keys .....                  | 6-28 |
| 6.9.4. Configuring “Switch Between” Options .....                        | 6-31 |

## Chapter 7. Using Blueberry3D Terrains

---

|                                                     |     |
|-----------------------------------------------------|-----|
| 7.1. Introduction .....                             | 7-2 |
| 7.1.1. Setting Blueberry3D Runtime Parameters ..... | 7-2 |
| 7.1.2. Setting the Blueberry3D Camera .....         | 7-3 |

## Chapter 8. Activating Scripts in VR-Forces

---

|                                                |     |
|------------------------------------------------|-----|
| 8.1. Activating Lua Scripts in VR-Forces ..... | 8-2 |
| 8.2. Adding a Script to the Action Menu .....  | 8-2 |
| 8.3. Activating a Script .....                 | 8-3 |

## Index



# Preface

This manual is for persons who will install or use VR-Engage. The manual assumes that you are familiar with basic administrative tasks and the graphical window environment for your operating system.

For the latest product information, please see release-specific documentation for your version of VR-Vantage.

## ***How the Manual Is Organized***

This manual is organized as follows:

- ♦ Chapter 1, *Introduction to VR-Engage*, describes the basic features of VR-Engage.
- ♦ Chapter 2, *Installing VR-Engage*, explains how to install VR-Engage software, the license manager, and an RTI.
- ♦ Chapter 3, *Starting VR-Engage*, explains how to start and stop VR-Engage, load a terrain, and connect to a simulation.
- ♦ Chapter 4, *Controlling People and Ground Vehicles*, explains how to control human characters and vehicles.
- ♦ Chapter 5, *Controlling Aircraft*, explains how to control aircraft and how to request SAR images.
- ♦ Chapter 6, *Mouse, Keypad, and Controller Mappings*, illustrates the mouse, keyboard, and game controller mappings configured in VR-Engage.
- ♦ Chapter 7, *Using Blueberry3D Terrains* explains how to configure Blueberry 3D terrains.
- ♦ Chapter 8, *Activating Scripts in VR-Forces* explains how to add scripts that you can send to VR-Forces.

## Documentation Set

Electronic versions of VR-Engage documentation are in *vrengagex.x/doc*. The documentation is accessible from the VR-Engage folder on the Start menu. The VR-Engage documentation set is as follows:

- ♦ *VR-Engage Users Guide* describes how to use the VR-Engage applications.
- ♦ *VR-Engage Release Notes* lists system requirements, release-specific requirements, new features and updates, bug fixes, and known problems.
- ♦ Online help. The online help, accessible from the Help menu, replicates most of the information in *VR-Engage Users Guide*.
- ♦ *VR-Engage First Experience Guide*. The First Experience Guide provides a brief guided tour of the most important VR-Engage features. It is primarily for new users and persons evaluating VR-Engage.
- ♦ *VR-Vantage Users Guide*. The VR-Engage startup view gives you access to many settings that affect the visual quality of your role-playing experience. These and other aspects of the graphical user interface are shared with VR-Vantage and VR-Forces. *VR-Vantage Users Guide* is included to provide documentation for display settings, navigation of the GUI, terrain considerations, and other information that may be of use to VR-Engage users, but which is not central to using VR-Engage.

## MAK Products

VR-Engage is a member of the VT MAK line of software products designed to streamline the process of developing and using networked simulated environments. The VT MAK 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.

- ♦ MAK RTI. An RTI (Run-Time Infrastructure) is required to run applications using the High Level Architecture (HLA). The MAK 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 entities, aggregate them into hierarchical units, assign tasks, set state parameters, and create plans that have tasks, set statements, and conditional statements. You can simulate using entity-level modeling, which focuses on the actions of individual people and vehicles, and aggregate-level modeling, which focuses on the interaction of large hierarchical units.

VR-Forces also functions as a plan view display for viewing remote simulation objects 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 PVD, and VR-Vantage IG) and the VR-Vantage Toolkit.
  - VR-Vantage Stealth displays a realistic, 3D view of your virtual world, 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. You can move your viewpoint to any location in the 3D world and can attach it to simulation objects so that it moves as they do.
  - 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 PVD provides a 2D plan view display. It gives you the big picture of the simulated world.
  - SensorFX. SensorFX is an enhanced version of VR-Vantage that uses physics based sensors to view terrain and simulation object models that have been materially classified. It is built in partnership with JRM Technologies.
  - The VR-Vantage Toolkit is a 3D visual application development toolkit. Use it to customize or extend MAK's VR-Vantage applications, or to integrate VR-Vantage capabilities into your custom applications. VR-Vantage is built on top of OpenSceneGraph (OSG). The toolkit includes the OSG version used to build VR-Vantage.
- ♦ MAK 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.
- ♦ 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.
- ♦ DI-Guy™. The DI-Guy product line is a set of software tools for real-time human visualization, simulation, and artificial intelligence. Every DI-Guy software offering comes with thousands of ready-to-use characters, appearances, and motions. DI-Guy enables the easy creation of crowds and individuals who are terrain aware, autonomous, and react intelligently to ongoing events. Save time, money and create outstanding simulations with DI-Guy. The DI-Guy product line includes the following products:
  - The DI-Guy SDK. Embed the DI-Guy library in your real-time application and populate your world with lifelike human characters.
  - DI-Guy Scenario™. Author and visualize human performances in a rich, user-friendly graphical environment. Use DI-Guy Scenario as an end visualization application or save scenarios and load them into your DI-Guy SDK enabled application.
  - ECOSim. Enhanced Company Operations Simulation (ECOSim) is a company-level training simulation that teaches leaders how best to deploy troops, UAVs, convoys, and other assets. ECOSim focuses on ease-of-use, rapid scenario generation, runtime operator control, and realistic and reactive human simulation.
  - DI-Guy AI. Generate crowds of autonomous characters to quickly populate your worlds with hundreds and thousands of terrain-aware, collision avoiding DI-Guys. Used as a module on top of DI-Guy Scenario and DI-Guy SDK.
  - Expressive Faces Module. Enable DI-Guy characters to have faces that display emotion, eyes that look in directions and blink, and lips that sync to sound files.
  - DI-Guy Motion Editor. Create or customize motions to your particular needs in an easy-to-use graphical application.
- ♦ RadarFX. RadarFX is a client-server application that simulates synthetic-aperture radar (SAR). The server application, which is based on VR-Vantage and SensorFX, loads a terrain database and, optionally, connects to simulations. A client application requests SAR images from the server. RadarFX includes a sample client application.
- ♦ VR-Engage. VR-Engage is a multi-role virtual simulator that lets users play the role of a first person human character, a ground vehicle driver, gunner or commander, or the pilot of a fixed wing aircraft or helicopter. It incorporates the VR-Force simulation engine and the VR-Vantage graphics rendering capabilities.

- ♦ WebLVC Server. WebLVC Server implements the server side of the WebLVC protocol so that web-based simulation federates can participate in a distributed simulation. It is part of the WebLVC Suite, which includes the server and several sample applications that work with VR-Forces and VR-Vantage.

## ***How to Contact Us***

For VR-Engage technical support, information about upgrades, and information about other MAK 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: | <a href="mailto:info@mak.com">info@mak.com</a>       |
| Technical support:             | <a href="mailto:support@mak.com">support@mak.com</a> |

### **Internet**

|                                           |                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------|
| MAK web site home page:                   | <a href="http://www.mak.com">www.mak.com</a>                                                   |
| License key requests:                     | <a href="http://www.mak.com/support/get-licenses">www.mak.com/support/get-licenses</a>         |
| Product version and platform information: | <a href="http://www.mak.com/support/product-versions">www.mak.com/support/product-versions</a> |
| For the free, unlicensed MAK RTI:         | <a href="http://www.mak.com/support/bonus-material">www.mak.com/support/bonus-material</a>     |

### **Post**

|                                |                                                                           |
|--------------------------------|---------------------------------------------------------------------------|
| Send postal correspondence to: | VT MAK<br>150 Cambridge Park Drive, 3rd Floor<br>Cambridge, MA, USA 02140 |
|--------------------------------|---------------------------------------------------------------------------|

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.                                                                                                                                                                                          |
| <b>Monospaced Bold</b>                                                              | Indicates a key on the keyboard.                                                                                                                                                                                                 |
| <i>Monospaced Italic</i>                                                            | Indicates command variables that you replace with appropriate values.                                                                                                                                                            |
| Blue text                                                                           | A hypertext link to another location in this manual or another manual in the documentation set.                                                                                                                                  |
| { }                                                                                 | 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 MAK products run on both Linux 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:<br>Choose <b>File</b> → <b>Save</b> .                                                                              |
|  | Click the icon to run a tutorial video in the default browser.                                                                                                                                                                   |
|  | 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-Engage home directory. For example, the directory *vren-gagex.x/doc* appears in the text as *./doc*.

## **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 context-sensitive menu, also called a popup menu or right-click 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***

MAK 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 MAK software that uses VR-Link uses some code that is distributed under the Boost License. All header files that contain Boost code are properly attributed. The Boost web site is: [www.boost.org](http://www.boost.org).

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

Permission is hereby granted, free of charge, to any person or organization obtaining a copy of the software and accompanying documentation covered by this license (the “Software”) to use, reproduce, display, distribute, execute, and transmit the Software, and to prepare derivative works of the Software, and to permit third-parties to whom the Software is furnished to do so, all subject to the following:

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.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

## **libXML and libICONV**

VR-Link and all MAK software that uses VR-Link, links in libXML and libICONV. On some platforms the compiled libraries and header files are distributed with MAK Products. MAK 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/>.

## **Freefont OpenType Font Set**

VR-Vantage applications and VR-Forces use the Freefont OpenType font set from the Free Software Foundation. It is covered by the General Public License (GPL). For details, please see: <http://www.gnu.org/licenses/gpl.html>

## **osgoculusviewer Library**

Copyright (c) 2013-2015, Swedish National Road and Transport Research Institute

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

Neither the name of the Swedish National Road and Transport Research Institute nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

## **NVIDIA**

The HDR implementation uses the HDR NVIDIA gameworks SDK example that has the following copyright notice:

Multiple Files in folder:     es3aep-kepler\HDR\

SDK Version: v2.11

Email:     gameworks@nvidia.com

Site:     <http://developer.nvidia.com/>

Copyright (c) 2014-2015, NVIDIA CORPORATION. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- ♦ Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- ♦ Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- ♦ Neither the name of NVIDIA CORPORATION nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.



# 1. Introduction to VR-Engage

This chapter is a brief introduction to VR-Engage.

|                                                           |      |
|-----------------------------------------------------------|------|
| VR-Engage Features.....                                   | 1-2  |
| VR-Engage Versions.....                                   | 1-2  |
| Simulation (Role-Playing) Capabilities.....               | 1-2  |
| User Interface.....                                       | 1-6  |
| Image Generator.....                                      | 1-7  |
| Terrain.....                                              | 1-7  |
| Integration with VR-Forces.....                           | 1-8  |
| Integration with Other MAK Products.....                  | 1-8  |
| After Action Review – Using MAK Data Logger.....          | 1-8  |
| Network Interoperability with Other Federates.....        | 1-8  |
| Extensibility.....                                        | 1-9  |
| Licensing.....                                            | 1-9  |
| Vortex License (for Ground Vehicle Dynamics).....         | 1-9  |
| RTDynamics License (For Aircraft).....                    | 1-9  |
| License Requirements for Hosting a VR-Forces Session..... | 1-10 |

## 1.1. VR-Engage Features

VR-Engage was developed for use in training simulations or laboratory experimentation. It lets users play the role of a first person human character, a vehicle driver, gunner or commander, or the pilot of an airplane or helicopter.

VR-Engage is built on mature proven technologies. It gets its simulation engine from VR-Forces, its game-quality 3D graphics from VR-Vantage, and its network interoperability from VR-Link.

VR-Engage includes:

- ♦ A high-fidelity vehicle physics engine needed for accurate vehicle motion.
- ♦ Ground, rotary and fixed-wing vehicles, and the full library of friendly, hostile, and neutral DI-Guy characters.
- ♦ Radio and voice communications over DIS and HLA.
- ♦ Sensors, weapons, countermeasures, and behavior models for air-to-air, air-to-ground, on-the-ground, and person-to-person engagements.
- ♦ Vehicle and person-specific interactions with the environment (open and close doors, move, destroy, and so on.)
- ♦ Terrain agility. As with VR-Vantage and VR-Forces, you can use the terrain you have or take advantage of innovative streaming and procedural terrain techniques.

### 1.1.1. VR-Engage Versions

VR-Engage has the following run-time versions:

- ♦ VR-Engage Ground. Allows you to control humans and ground vehicles.
- ♦ VR-Engage Air. Allows you to control fixed-wing and rotary-wing aircraft.
- ♦ VR-Engage. Allows you to control air, ground, and human entities.

All three configurations are installed as part of the standard VR-Engage installation process. Your access to them depends on your VR-Engage license. For simplicity, the procedures in this manual assume you are using VR-Engage.

### 1.1.2. Simulation (Role-Playing) Capabilities

VR-Engage lets you choose which entity you want to simulate. Said another way, you choose the role you want to play. You can play:

- ♦ Dismounted soldiers and other human characters.
- ♦ A member of the crew of a ground vehicle.
- ♦ A helicopter or fixed-wing aircraft pilot.

## **Dismounted Soldiers and Other Human Characters**

If you take the role of a dismounted soldier or other human character, you have access to the full DI-Guy library of friendly, hostile, and neutral characters. Your character has the following capabilities:

- ♦ Individual movement (look, run, walk, crawl, crouch, prone).
- ♦ Interact with environment (open and close doors).
- ♦ Interact with other characters (shoot at and be shot at).
- ♦ Sensors (binoculars and night vision goggles (NVG)).
- ♦ Weapons (rifles, grenades).
- ♦ Use carried gear, such as a flashlight, range finder, or compass.
- ♦ Lase targets for other players or simulated entities.
- ♦ CGF Assist (passenger, fast-roping). When you are running a VR-Forces scenario, you can give up control of your character and let the simulation engine manage complex behaviors.
- ♦ Embark and disembark. Enter and leave vehicles and take on roles of vehicle crew members.



Figure 1-1. Dismounted infantry

## Ground Vehicle Crew

VR-Engage lets you take on the roles of the driver, gunner, or commander of a ground vehicle (one role at a time, of course) that has the following capabilities:

- ♦ Physics-based ground vehicle dynamics model.
- ♦ Interact with environment (destroy).
- ♦ Ground-to-ground engagements:
  - Sensors (EO, IR, NVG).
  - Weapons (main gun, machine gun).
  - Signals/Countermeasures (smoke grenades).
- ♦ Vehicle controls (headlights, tail lights).
- ♦ CGF Assist (drive, gun). In a VR-Forces scenario, as you switch roles, the simulation engine can take over the tasks and plans that manage the other roles for the vehicle. For example, if you are the gunner, VR-Forces can manage driving the vehicle.



Figure 1-2. LAV gunner

You can easily switch roles and can disembark from the vehicle to assume the role of a dismounted soldier.

## Pilot

As a pilot, you can fly an aircraft with the following capabilities:

- ♦ Physics-based fixed & rotary wing dynamics models.
- ♦ Multi-function cockpit display. Flight instruments, map/chart, imagery.
- ♦ Air to Air Engagements:
  - Sensors (radar scope, radar warning receiver).
  - Weapons (missiles).
  - Countermeasures (chaff, flares).
- ♦ Air to Ground Engagements:
  - Sensors (IR targeting, SAR (requires RadarFX Server)).
  - Weapons (missiles, guns, bombs).
  - Countermeasures (chaff, flares).

Pilots use their out-the-window views and head-up display (HUD) (Figure 1-3) to understand their environment and control their aircraft.

- ♦ Single screen. Out-the-window view, on-screen controls, and HUD.
- ♦ Dual screen. Out-the-window view, on-screen controls, and HUD.
- ♦ On-screen multi-function display (IR, SAR (requires SensorFx)) (Figure 1-4).
- ♦ Slaved IG (requires VR-Vantage Remote Display Engine).

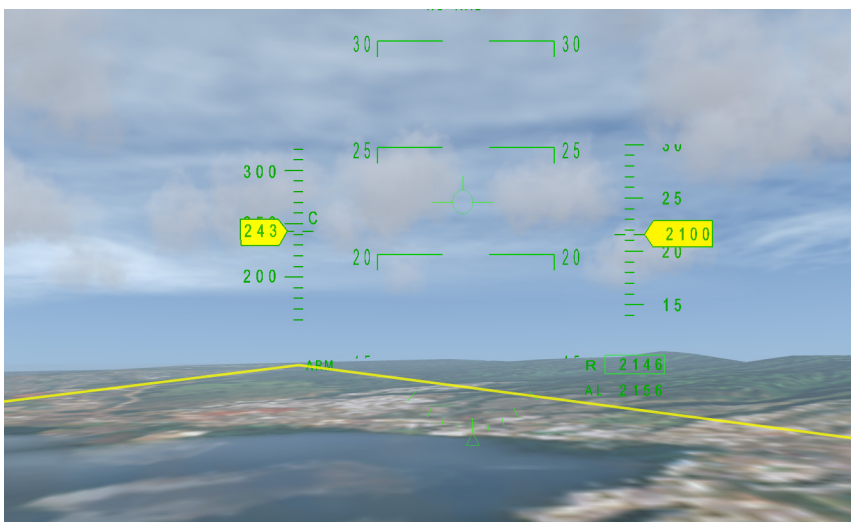


Figure 1-3. Head-up display

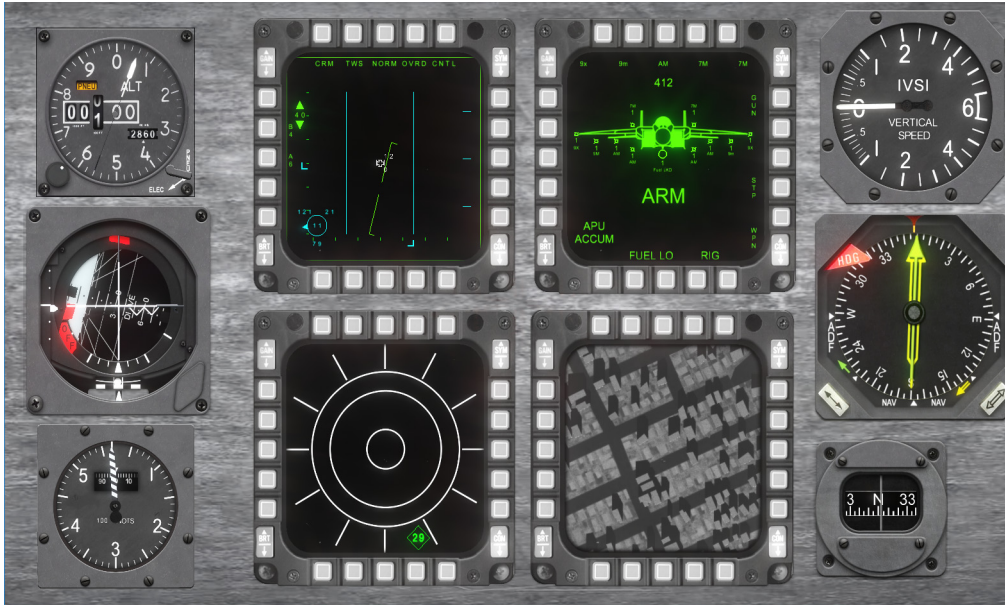


Figure 1-4. Instrument panel

### 1.1.3. User Interface

You can control your character using the keyboard, mouse, and game controllers. The graphical user interface provides command menus and cockpit and crew cabin displays. Other interfaces include:

- Radio (push-to-talk, radio channels, MAK Data Logger support).
- Control with role specific devices (driver-steering wheel, pilot-HOTAS).
- Display system support (monitors, projectors, Oculus Rift).
- Audio (engine sounds, environmental noise, event effects, warning tones).

### 1.1.4. Image Generator

VR-Engage includes a built-in image generator, based on VR-Vantage IG, that can support multiple display channels, to the limits of your installed graphics card. It can also be extended to fill larger multi-channel display systems by adding VR-Vantage IG Remote Display Engines. This is an example of the flexibility of MAK's product architecture that lets you configure a system of any size.

Regardless of which role your VR-Engage simulator is playing, VR-Engage delivers realistic scene rendering (terrain, entities, interaction effects, weather, clouds, time-of-day, lighting, shadows, high dynamic range (HDR) lighting.)

The image generator supports the following configurations:

- ♦ Single screen.
- ♦ Dual screen.
- ♦ Multi-channel distributed rendering (requires VR-Vantage Remote Display Engine). Spread the view across multiple monitors run by multiple computers.
- ♦ IR and NVG Sensors using the included CameraFX or optional SensorFX.
- ♦ On screen Multi-function Display (IR, SAR (requires SensorFX)).

### 1.1.5. Terrain

VR-Engage, like VR-Vantage and VR-Forces, lets you use the terrain you have or take advantage of innovative streaming and procedural terrain techniques to simulate on large, complex terrains.

- ♦ Terrain agile (all types supported by VR-Vantage and VR-Forces).
- ♦ Dynamic terrain. Destroyable buildings, bridges, and props.
- ♦ Dynamic ocean. Waves, spray, wakes, wind.

VR-Engage includes a set of useful geo-specific terrains and options for building more. Please see *VR-Vantage Users Guide* for information about terrain support. (*VR-Vantage Users Guide* is included with VR-Engage.)

## **1.2. Integration with VR-Forces**

When VR-Engage is used with a compatible version of VR-Forces and other MAK products, you can reap the additional benefits of a common system architecture:

- ♦ Common representation of the environment across player and CGF stations, including synchronized weather, time-of-day, and dynamic terrain.
- ♦ Build terrains, models, and configurations once, and deploy them across VR-Engage player stations, VR-Forces simulation engines and front-ends, and any other applications that use VR-Vantage IG.
- ♦ Role-play multiple entities at a time by switching between manual and CGF control on-the-fly. Take control of VR-Forces-driven entities.
- ♦ Configure players with the VR-Forces Simulation Object Editor.
- ♦ Create scenarios in VR-Forces and load them in VR-Engage for stand-alone use.
- ♦ Automatic WebLVC integration (tablet-based IOS, and so on.)

## **1.3. Integration with Other MAK Products**

Previous sections have discussed VR-Engage's integration with VR-Forces and VR-Vantage. Additionally, like all MAK products, VR-Engage uses VR-Link for network interoperability and supports DIS and HLA. It integrates seamlessly with our other Link products, such as MAK Data Logger for recording and AAR, the MAK RTI for HLA support, and VR-Exchange for data interchange in heterogeneous simulation environments.

### **1.3.1. After Action Review – Using MAK Data Logger**

Whether in standalone mode or when playing with other simulation applications, VR-Engage publishes to the DIS or HLA network. Therefore, you can use the MAK Data Logger to record your simulation and play the recording back for after-action-review (AAR).

### **1.3.2. Network Interoperability with Other Federates**

VR-Engage is natively compliant with DIS and HLA, so it can participate in any topology of networked simulators and simulation support systems, including multi-player classroom environments. It can interoperate with existing simulation applications and 3rd party simulators, SAFs, and CGFs.

## 1.4. Extensibility

VR-Engage is ready to use out-of-the-box. It can be deployed as a trainee simulator, as a role player station, an instructor aid, a desktop simulation game, or even as a VR headset experience.

Because MAK focuses on the needs of system integrators, we designed flexibility into VR-Engage. It can be customized and extended to meet program-specific requirements, and can be integrated into a diverse range of system configurations. MAK has a pricing and support model that has proven to be effective with system integrators both before and after they choose MAK.

## 1.5. Licensing

The VR-Engage application requires a VR-Engage run-time license in order to run. Internally, VR-Engage relies on VR-Vantage capabilities for its 3D visualization, VR-Forces capabilities for its ownship simulation, VR-Link for its networking, and so on. These capabilities are part of VR-Engage and do not require separate run-time licenses of these MAK products.

### 1.5.1. Vortex License (for Ground Vehicle Dynamics)

VR-Engage uses Vortex from CM Labs for its ground vehicle dynamics. This capability is included with VR-Engage. You do not need a separate license.



For VR-Engage 1.1, you may need a temporary license. Please see *VR-Engage 1.1 Release Notes* for details.

---

### 1.5.2. RTDynamics License (For Aircraft)

VR-Engage uses RTDynamics for its aircraft vehicle dynamics. This capability is included with VR-Engage. You do not need a separate license.



For VR-Engage 1.1, you may need a temporary license. Please see *VR-Engage 1.1 Release Notes* for details.

---

### 1.5.3. License Requirements for Hosting a VR-Forces Session

With only a VR-Engage license, you can run VR-Engage, choose a terrain database to simulate on, create and place an entity, and control that entity. VR-Engage can only simulate and control a single entity at a time. When you change role and create a different entity to simulate, the entity you were previously simulating is deleted and replaced by the new one.

If you are running a copy of VR-Forces on your network (which requires a VR-Forces license of course), then VR-Engage can interact with VR-Forces in the following ways:

- VR-Engage allows you to join a VR-Forces session and take manual control of one of the entities in the VR-Forces scenario. If you are controlling a VR-Forces entity, and then change role and ask to control a different entity, the original entity will still exist, as it is owned by VR-Forces.
- VR-Engage can initiate and receive changes to the terrain, for example, opening doors or destroying buildings. (VR-Forces acts as the dynamic terrain server).
- VR-Engage can reflect changes to time-of-day and weather that are published by VR-Forces.
- VR-Engage allows you to assign certain tasks to entities that are simulated by VR-Forces (for example, tell a subordinate to follow you, or move to a location you designate).

In order to simplify the startup workflow for certain use cases, VR-Engage gives you the ability to launch a VR-Forces back-end directly from the VR-Engage user interface, and to instruct VR-Forces to load and host a scenario of your choosing. This allows you to avoid separately launching VR-Forces from the start menu or command line, and automatically ensures that VR-Forces uses the same interoperability parameters as VR-Engage. A VR-Forces back-end license is always required to run VR-Forces, whether you launch it from the VR-Engage user interface, or launch it separately from the Start Menu or command line. If you do not have a VR-Forces back-end license available, VR-Engage will not allow you to launch VR-Forces and host a VR-Forces scenario.

When VR-Engage starts up, it looks for a running VR-Forces and if it finds one, it connects to it. If it does not find one, it offers you the option to host and load a VR-Forces scenario, or start an unhosted session. If you host a VR-Forces scenario, you will consume a VR-Forces license, which will prevent you from starting VR-Forces independently if you only have one license. If you start an unhosted session, you can start or join a session only as an individual player - you cannot load and run a scenario.



## 2. Installing VR-Engage

This chapter explains how to install the VR-Engage applications and data. You must also install the MAK license manager. To use VR-Engage with HLA, you must install an RTI.

|                                                         |     |
|---------------------------------------------------------|-----|
| Installing VR-Engage .....                              | 2-2 |
| Installing VR-Engage on Windows.....                    | 2-2 |
| The VR-Engage Directory Structure.....                  | 2-4 |
| Installing and Setting Up the MAK License Manager ..... | 2-5 |
| Specifying the License Server.....                      | 2-6 |
| Installing an RTI .....                                 | 2-8 |
| Installing the MAK RTI.....                             | 2-8 |

## 2.1. Installing VR-Engage

A full VR-Engage installation includes three components: the application, the License Manager software, and for HLA operation, an RTI (or Runtime Infrastructure.)

Before you install VR-Engage, please read the Release Notes to see if there are any special instructions for installation.

VR-Engage has an application installer and two data packages (*.MAK-targz*). (The base data package is broken up into four files.) You must run the application installer and then install the base data package. The application installer can automatically install the base data package if you configure it to do so. The second data package, VR-Engage Demo Terrains, is optional. It contains the Surobi and Baqa terrains from SimthetiQ and Blueberry3D, respectively.

### 2.1.1. Installing VR-Engage on Windows

Note the following:

- You must have administrator privileges to install MAK products on Windows Vista.
- When you install large applications on Windows Vista or later, there may be a delay of up to several minutes from the time you try to run the setup program to the time that an installation dialog box is displayed. This is due to how Windows scans setup programs before it executes them. If you experience this problem, turning off User Access Control can reduce or eliminate this delay.

Windows versions of VR-Engage are provided as executable installer files on DVD, or as downloaded files. The installers are named to indicate the compiler used to build that version of VR-Engage.

- To install VR-Engage, run the application installer. Follow the instructions in the installation wizard. You can specify that the application installer automatically find and install the data package (it must be in the same directory as the application installer), or you can specify that the MAK Data Installer open and let you select the data package to install.

### **Installing the VR-Forces Plug-in**

When the VR-Engage installer completes the data installation, it prompts you to install a plug-in for VR-Forces. The VR-Forces plug-in lets you take control of VR-Forces entities from VR-Engage. If you have VR-Forces installed and want to install the plug-in, continue the installation process.

You do not have to install the plug-in when you install VR-Engage. You can install it later by running the installer. It is in the VR-Engage top level directory.

The VR-Forces plug-in makes the following changes to VR-Forces:

- ♦ Installs custom models.
- ♦ Copies *./data/simulationModelSets/EntityLevel.sms* to *EntityLevel\_VRF.sms*. If you uninstall the VR-Engage plug-in, it uses this file to restore *EntityLevel.sms*.
- ♦ Add RTDynamics and VREngage simulation model sets.

The plug-in preserves any changes that you have made to *EntityLevel.sms*. If you uninstall the VR-Engage plug-in, your changes to *EntityLevel.sms* are not lost.

When you uninstall VR-Engage, the uninstaller does not uninstall the data package. You must delete the files manually.

## 2.2. The VR-Engage Directory Structure

The installation process creates the VR-Engage directory tree shown in [Figure 2-1](#) (runtime and toolkit). [Table 2-1](#) describe the contents of the directories.

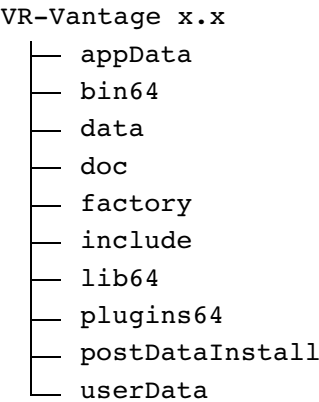


Figure 2-1. VR-Engage directory tree

[Table 2-1](#) describes the contents of the directories.

Table 2-1: Contents of VR-Engage directories

| Directory                | Directory contents                                                                                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------|
| <i>./appData</i>         | Subdirectories contain data required by the VR-Engage applications, such as model definitions and saved settings. |
| <i>./bin64</i>           | Executables and dynamic link libraries.                                                                           |
| <i>./data</i>            | Sample databases, images, and vehicle models.                                                                     |
| <i>./doc</i>             | VR-Engage documentation and class reference files.                                                                |
| <i>./factory</i>         | Default settings (for reverting to “factory” settings).                                                           |
| <i>./include</i>         | Header files for the VR-Engage Toolkit API.                                                                       |
| <i>./lib64</i>           | Libraries for building applications with the VR-Engage Toolkit API.                                               |
| <i>./plugins64</i>       | Plug-in shared libraries.                                                                                         |
| <i>./postDataInstall</i> | Files that get installed after the initial data installation.                                                     |
| <i>./userData</i>        | Terrain and scenario files.                                                                                       |

## 2.3. Installing and Setting Up the MAK License Manager

Before you can use a MAK product, you must obtain a valid license file, install the MAK License Manager, and configure the license server and client machines. The License Manager uses a client-server architecture, so you do not need to install the License Manager on every computer on which you install MAK products. You only need to install it on the computer that you will use as the license server.



If you have already installed the License Manager for another MAK product, you do not have to install it again. You just need to make sure you have licenses for your newly installed products.

---

The License Manager installer is included on MAK installation media. It is separate from the product installers. You can download the installers from our web site at <http://www.mak.com/license-support.html> or you can download directly from:

<ftp://ftp.mak.com/out/MAKLicenseManager-win64-setup.exe>

Complete installation and configuration instructions are included with the License Manager installer. Instructions are also available at the license support page.

Some customers use dongle licenses instead of running a license server. Instructions for using dongles are in the License Manager documentation.



This release may require temporary licenses for Vortex or RTDynamics. Please see *VR-Engage Release Notes* for details.

---

### 2.3.1. Specifying the License Server

The first time you run a MAK application on a particular computer, the License Setup dialog box opens (Figure 2-2). It prompts you to enter the hostname of the license server and optionally, a port number.

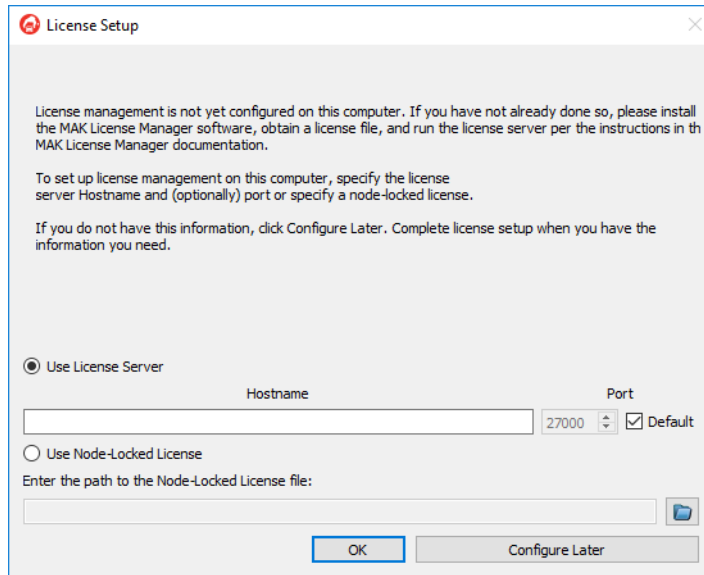


Figure 2-2. License Setup dialog box

If you do not know the hostname of the license server, click Configure Later. When you have the hostname, you can start the application again and complete the dialog box. You will not be able to run any MAK applications until you set up license management.

If you know the hostname, type it in the Hostname box. Then click OK. The application will start.

Under limited circumstances, MAK issues node-locked licenses. If you have a node locked license, select the Use Node Locked License option and enter the path to the license file.



- ♦ If you are running MAK products on the license server machine, it is also a client, so you must specify the license server on that machine too.
- ♦ If you change the license server, the saved configuration will no longer be valid and the License Setup dialog box will open the next time you start a MAK application.
- ♦ You can clear the saved license configuration by deleting the cache file.  
On Windows, it is  
`C:\Users\user_name\AppData\Roaming\MAK\licenses<n>.txt`. (The `AppData` directory is hidden by default.) On Linux, it is  
`.mak/license<n>.txt`. (There may be more than one cache file, for example, `licenses1.txt` and `licenses2.txt`.)

---

### The MAKLMGRD\_LICENSE\_FILE Environment Variable

As an alternative to using the License Setup procedure described in the previous section, you can configure the license server in an environment variable. The MAKLMGRD\_LICENSE\_FILE environment variable identifies the server machine. If you set this environment variable, it overrides the settings stored by the License Setup procedure.

The syntax for the environment variable is: `@Server_name`. For example, if the server machine is oak, set the environment variable to `@oak`.

The following sections explain how to set environment variables on the different platforms that MAK products run on.

#### Windows

##### To add the MAKLMGRD\_LICENSE\_FILE in Windows:

1. Open the Control Panel.
2. Click System and Security.
3. Click System.
4. In the sidebar menu, click the Advanced System Settings. The System Properties dialog box opens.
5. Click Environment Variables. The Environment Variables dialog box opens.
6. Click New. The New System Variable dialog box opens.
7. In the Variable Name field, enter MAKLMGRD\_LICENSE\_FILE.
8. In the Variable Value field, enter `@server_name`, where `server_name` is the name of the license server.
9. Click OK to back out of each dialog box and set the variable.



---

Different versions of Windows have slightly different wording of the various Control Panel options.

---

## 2.4. Installing an RTI

An RTI is a software library (and perhaps supporting executables) that implements an HLA Interface Specification. In HLA, applications exchange FOM data through RTI calls, which means that all HLA applications need to use an RTI.



---

Because of differences in the low-level network mechanisms used by different RTI implementations (which include, but are not limited to packet layout), applications that want to interoperate in the same federation execution must use the same RTI implementation.

---

Because RTIs are usually provided as dynamic libraries that implement a fixed API, a federation can often switch from one RTI implementation to another between runs (without even recompiling the applications), but during each run, all participants must agree on which RTI to use, much as they must also agree on which FOM to use.

For the most recent information about the RTI versions supported by MAK products, please see the release notes for your MAK application.

### 2.4.1. Installing the MAK RTI

To install the MAK RTI, follow the instructions in Chapter 2 of *MAK RTI Users Guide*.

#### Configuring Your System to Use the MAK RTI

The RTI dynamic libraries must be located somewhere on your dynamic library search path.

The MAK RTI needs to know where to find the following configuration files:

- ♦ The federation configuration file (*.fed*, *.fdd*, or *.xml*) for your federation execution (required).
- ♦ The RID file (*rid.mtl*) (optional).

Put the configuration files in the directory from which you are running, or set the environment variable `RTI_CONFIG` to the directory that contains them.

## **Running Applications with the MAK RTI**

### **To run a MAK application with the MAK RTI:**

1. Be sure the license server is running.
2. Start the application. The RTI Assistant will prompt you to choose an RTI configuration.
3. Choose a configuration. If necessary start the rtiexec.
4. Click Connect. The application should run.

In many cases, you do not need to run the rtiexec to use the MAK RTI, however you can run the rtiexec if you want to. (It is required to use certain features of the MAK RTI.) For more information, please see your RTI documentation.





## 3. Starting VR-Engage

This chapter describes how to start up VR-Engage, connect to a session, and choose a role.

|                                                    |      |
|----------------------------------------------------|------|
| Starting VR-Engage .....                           | 3-2  |
| Hosting a VR-Forces Session .....                  | 3-2  |
| Starting an Unhosted Session .....                 | 3-4  |
| Choosing a Role .....                              | 3-5  |
| Connecting to VR-Forces .....                      | 3-8  |
| Changing Your Role .....                           | 3-8  |
| Changing Your Role in the Change Role Panel .....  | 3-8  |
| Changing Your Role by Embarking on a Vehicle ..... | 3-9  |
| Starting a New Session .....                       | 3-10 |
| Setting Up the Simulation Connection .....         | 3-10 |
| Creating a Startup Configuration .....             | 3-12 |
| Playing in Windowed Mode .....                     | 3-13 |

## 3.1. Starting VR-Engage

When you start VR-Engage, it looks for an instance of VR-Engage that is already running or an instance of VR-Forces that is running. If it finds one, it immediately connects to that session, loads the terrain it is using, and then asks you what character you want to control. If it does not find a session, it stops and ask you what to do. You can host a VR-Forces session or start an unhosted session.

You can set some of the startup behaviors with a startup configuration script. For details, please see [“Creating a Startup Configuration,”](#) on page 3-12.

### 3.1.1. Hosting a VR-Forces Session

VR-Engage includes scenarios that were created using VR-Forces. When you host a VR-Forces session, you can load one of these scenarios or create a new scenario. If you run an existing scenario, you can control any of the entities in them. If you create a new scenario, you can only create and control one entity.



You cannot save scenarios that you create in VR-Engage. The principal benefit of hosting a VR-Forces session and creating a new scenario is that a VR-Forces session supports global weather and dynamic terrain.

---

If other instances of VR-Engage are running, they can connect to the session.



When you host a VR-Forces session, you use a VR-Forces license. If you only have one VR-Forces license and you host a VR-Forces session from VR-Engage, you will not be able to start the VR-Forces application.

---

**To start VR-Engage and host a VR-Forces session:**

1. On the Start menu, choose **MAK Technologies** → **VR-Engage**. The VR-Engage window opens. If VR-Engage finds a VR-Forces session, it connects to it. If it does not find a session, the Searching for Session dialog box opens (Figure 3-1).

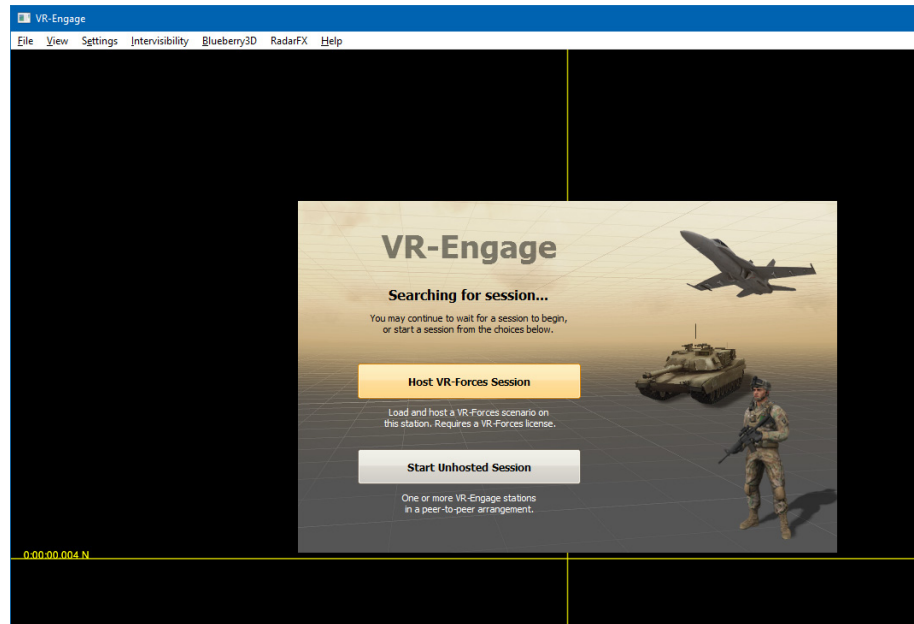


Figure 3-1. Searching for Session dialog box

**i**

During the initial stages of joining a session, the VR-Engage window has a title bar and menu bar typical of most windowed applications. We call this windowed mode. Once you select a character and start controlling it, you enter fullscreen mode. Fullscreen mode does not have menus or other window controls. Although fullscreen mode is the default for controlling characters, you can also control them in windowed mode. For details, please see “[Playing in Windowed Mode,](#)” on page 3-13.

2. Click Host VR-Forces Session. You are prompted to load a scenario or create a new scenario.

3. If you click Load a Scenario:
  - a. The Choose a Scenario for this Session dialog box opens.
  - b. Select the scenario you want to load.
  - c. Click OK. VR-Engage loads the scenario. It displays the scenario in Plan View mode and opens the Choose Role Panel.If you click Create a New Scenario:
  - a. The Choose a Terrain for this Session dialog box opens.
  - b. Select the terrain you want to load. (If you want to use different terrains for the GUI and the simulation engine, select the Use Alternate Simulation Terrain and select a terrain from the list.)
  - c. Click OK. VR-Engage loads the terrain. It displays the scenario in Plan View mode and opens the Choose Role Panel.
4. Choose a role, as described in [“Choosing a Role,”](#) on page 3-5.

### 3.1.2. Starting an Unhosted Session

In an unhosted session, you can create and control one character. If there are other VR-Engage unhosted sessions running or other simulations on the network, you can interact with them. However, you will not be able to take control of entities in the other simulations.

Unhosted sessions do not support dynamic terrain. Characters cannot open and close doors.

**To start VR-Engage and host a VR-Forces session:**

1. On the Start menu, choose **MAK Technologies** → **VR-Engage**. The VR-Engage window opens. If VR-Engage finds a VR-Forces session, it connects to it. If it does not find a session, the Searching for Session dialog box opens ([Figure 3-1](#)).
2. Click Start Unhosted Session. The Choose a Terrain for this Session dialog box opens.
3. Select a terrain. (If you want to use different terrains for the GUI and the simulation engine, select the Use Alternate Simulation Terrain and select a terrain from the list.)
4. Click OK. VR-Engage displays the terrain in Plan View mode and the Choose Role Panel opens.
5. Choose a role, as described in [“Choosing a Role,”](#) on page 3-5.

## 3.2. Choosing a Role

When you connect to or start a session, you must choose a role to play. The VR-Engage window lists the available roles in the Choose Role panel (Figure 3-2). If you start a new scenario or an unhosted session, you must create a new entity and choose that entity.

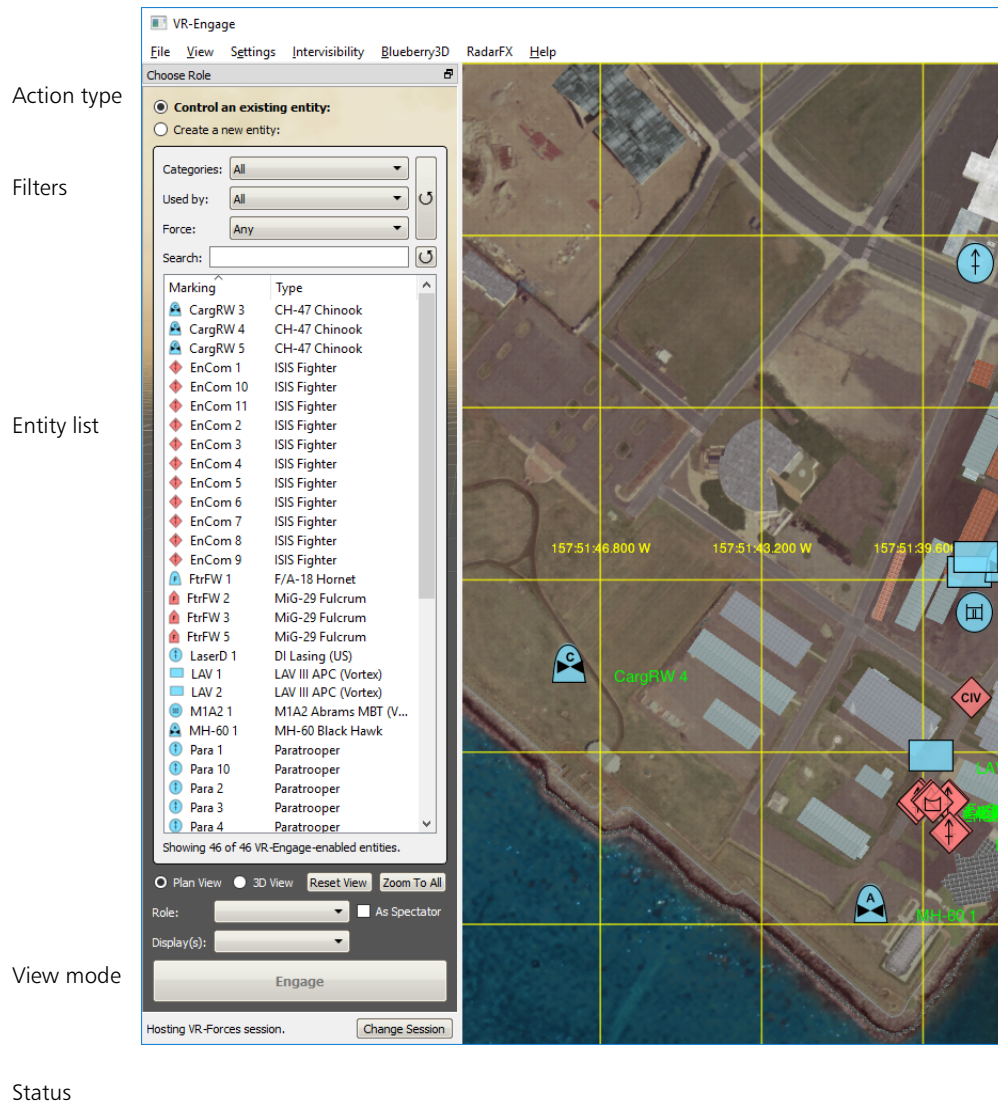


Figure 3-2. Choose Role panel



VR-Engage users usually control a character in the simulation. However, you can also participate as a spectator. A spectator attaches to an entity just like a player would, but cannot control the entity. The entity would be controlled by another player or by another application, such as VR-Forces.

**To choose a role:**

1. Choose an option for selecting an entity, as follows:
  - Attach to an existing entity. The panel lists the entities in the loaded scenario, if any.
  - Create a new entity. The panel lists the entity types that you can create.
2. Optionally, filter the list by category, country (used by), force, or search string.
3. Optionally, switch from plan view display mode (2D) to the 3D view by selecting an option at the bottom of the panel. If you have loaded a scenario, you can also zoom to the extents of the entities in the entity list by clicking Zoom to All. (Filtering the list affects the results of Zoom to All.)
4. If you are attaching to an existing entity, select an entity in the list or by clicking it on the terrain.

If you want to create a new entity:

- a. Select an entity in the list.
- b. In the Marking box ([Figure 3-3](#)), type a name for the character. The maximum length is 11 characters.
- c. If you are creating an aircraft, the default altitude is 2000 meters. If you want to change the starting altitude, type a value in the Altitude box.
- d. Click on the terrain where you want to place the entity. (You can navigate the Plan View or 3D view using your mouse and keyboard. For details about navigating the terrain, please see Chapter 15, *Moving the Observer*, in *VR-Vantage Users Guide*.)

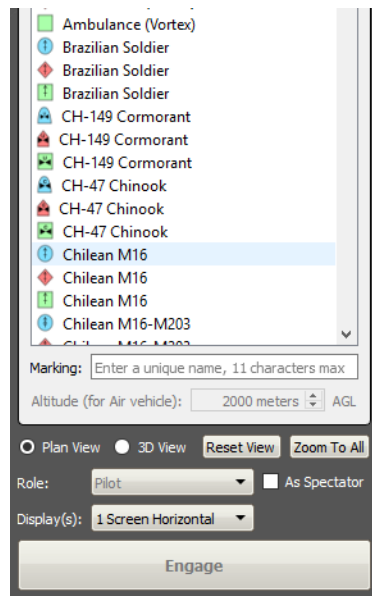


Figure 3-3. List of entities to create

5. If the selected entity has multiple roles, such as those on a vehicle, select an option from the Role list.
6. If the selected entity is an aircraft, select a display option from the Display(s) list. For information about aircraft display options, please see [“Aircraft Display Options,”](#) on page 5-6.)
7. If you just want to observe the simulation from the perspective of the selected character, but not actually control it, select the As Spectator check box.
8. If you selected an aircraft, in the Display(s) list select a display option. (For details about display options, please see [“Aircraft Display Options,”](#) on page 5-6.)
9. Click Engage. VR-Engage changes to fullscreen mode. You can now control your character and participate in the scenario.

### 3.3. Connecting to VR-Forces

VR-Engage can interact with any DIS or HLA simulation. However, it has a particular ability to participate in simulations that use VR-Forces, MAK's computer generated forces application. By default, when you start VR-Engage, it looks for a VR-Forces session to join. If it connects to a complementary VR-Forces build that has the VR-Engage plug-ins installed, you can take control of entities being simulated by VR-Forces. You can assume control of VR-Forces entities and give up control as desired.

When you take control of a VR-Forces entity, the entity pauses the plan or task it is executing. When you give up control of a VR-Forces entity, control returns to VR-Forces and the entity resumes whatever task or plan it was executing before you took control of it.

### 3.4. Changing Your Role

If a scenario has multiple entities, you can change the role you are playing to be any entity in a scenario. You can change your role by exiting the simulation and choosing a new role. You can also change a role by embarking on a vehicle and choosing an available role.

#### 3.4.1. Changing Your Role in the Change Role Panel

You can change your role by returning to the Change Role Panel.



When you leave full screen mode to change your role, if you are connected to a VR-Forces session, the scenario continues running.

---

##### To change your role:

1. Press **Escape**. VR-Engage exits full screen mode and displays the Change Role panel ([Figure 3-2](#)).
2. Select the role you want, as described in “[Choosing a Role](#),” on page 3-5.
3. Click Engage.

### 3.4.2. Changing Your Role by Embarking on a Vehicle

You can change your role dynamically while you are participating in a simulation. The LAV has four roles associated with it: Gunner, Driver, Commander, and Passenger. If you embark on a LAV, you can assume any of these roles. Other vehicles have different sets of roles available.

**To change your role by embarking on a vehicle:**

1. Walk towards a vehicle that supports embarkation. When you get close to the vehicle, the Embark menu opens ([Figure 4-2](#)).



Figure 3-4. Embark LAV menu



If the Embark menu closes before you make a selection, back up your character a few steps and approach the vehicle again.

---

2. Use the up and down arrow keys or the up and down buttons on your D-pad to select a role.
3. Press the right arrow key or right button on the D-pad to embark using the selected role.

### 3.5. Starting a New Session

You can exit the session you are participating in and join or start a new session.

**To change the scenario:**

1. Press **Escape**. The view changes to windowed mode.
2. On the Choose Role Panel, click New Session. The Searching for A Session dialog box is displayed.
3. Follow the procedure for starting a session, as described in [“Starting VR-Engage,”](#) on page 3-2.

### 3.6. Setting Up the Simulation Connection

To participate in a simulation, you must connect VR-Engage to a simulation network. VR-Engage includes connectors for DIS, HLA 1.3, and HLA Evolved (IEEE 1516-2010, also referred to as HLA 1516e). You can change the configuration values of the default connectors and you can add connectors.

VR-Engage needs to connect to a network at startup. By default, it automatically connects to the DIS network using port 3000. If you want to use a different network protocol or a different port, you must change the auto-connect setting.



You cannot change the connection while VR-Engage is running. If you need to change the connection, you must change the auto-connect setting as described in this section and then restart VR-Engage.

---

For complete details about connection settings and parameters, please see *VR-Vantage Users Guide*.

**To set up the simulation connection:**

1. Start VR-Engage.
2. Choose **Settings** → **Connection**. The Simulation Connections dialog box opens ([Figure 3-5](#)).

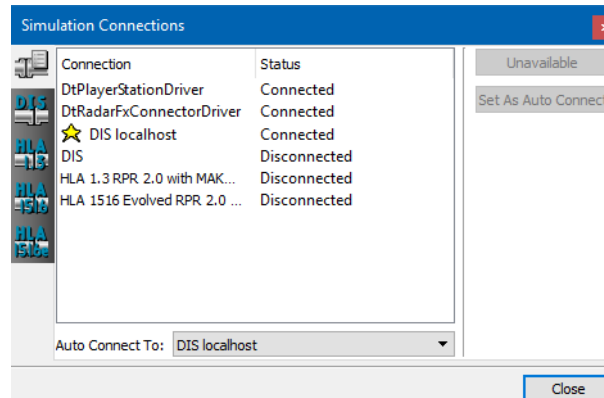


Figure 3-5. Connection Status page

3. Select the page for the connection type that you want to use.
4. Select a connection in the Connections list (Figure 3-6).

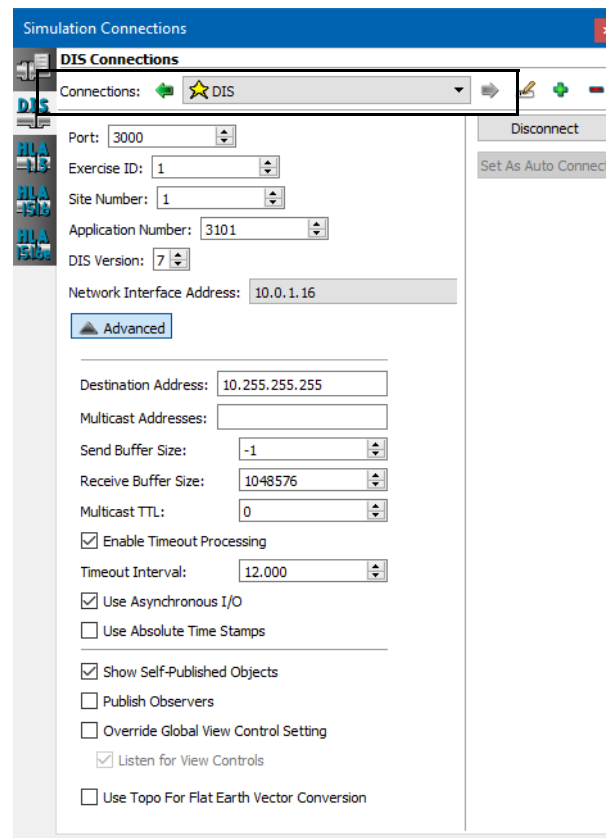


Figure 3-6. HLA 1.3 Connections page

5. Change connection parameters if necessary.

6. Click Set As Auto Connect.
7. Click Close.
8. Shut down VR-Engage.
9. Start VR-Engage. It will connect to the network you specified.

### **3.7. Creating a Startup Configuration**

You can create a startup configuration to automate some aspects of VR-Engage startup. VR-Engage includes a fully commented example startup configuration script called *exampleStartupConfig.lua* in *./appData/scripts*.

You can specify the following startup parameters in a script:

- ♦ **mode**. Tells VR-Engage to only **join** a running session, immediately **host** a session, or immediately **start** an unhosted session.
- ♦ **scenario**. Optional. If the **mode** is **host**, specifies the scenario to host. If you do not specify a scenario, VR-Engage uses the value for **terrain** or prompts you to specify a terrain.
- ♦ **terrain**. Specifies the terrain to load in **start** mode, or in **host** mode if you do not specify a scenario.
- ♦ **guiTerrain**. Optional. Specifies the terrain to use for visualization if you want to visualize on a terrain that is different from the simulation terrain.
- ♦ **attach**. Specifies an entity to control or attach to as a spectator.
- ♦ **entity**. Optional. If **attach** is not specified, this parameter specifies an entity to create.

To use a startup configuration script, create a shortcut or batch file with the following command:

```
vrEngageversion.exe --initSettingsFile startupConfigFile
```

where:

- ♦ **vrEngageversion.exe** is one of the VR-Engage executables (*VR-EngageAir.exe*, *VR-EngageGround.exe*, *VR-EngageCombined.exe*.)
- ♦ **startupConfigFile** is the name of your startup configuration file, including the *.lua* extension. If you use a simple file name, VR-Engage looks for the file in *./appData/scripts*. You can also specify a relative path from the *./bin64* directory or a fully qualified path.

### ***3.8. Playing in Windowed Mode***

By default, when you click Engage to control a character, you go into fullscreen mode. There are no menus or other window controls available. If you want access to menus without escaping to the Choose Role Panel, you can exit fullscreen mode, but still control your character. This is called windowed mode.

Whenever you go from fullscreen to windowed mode, VR-Engage releases mouse control so that you can use the mouse to access menus. You can toggle mouse control on and off. (For more information about mouse control, please see [“Enabling and Disabling Mouse Control,”](#) on page 6-3.)

- To change from fullscreen mode to windowed mode, press **Control+Enter**. To return to fullscreen mode, press **Control+Enter** again.





## 4. Controlling People and Ground Vehicles

This chapter describes the things you can do when you are playing in a ground-based scenario.

|                                                  |      |
|--------------------------------------------------|------|
| Introduction .....                               | 4-3  |
| Moving Your Character Around the Terrain .....   | 4-3  |
| Displaying the Action Menu .....                 | 4-3  |
| Choosing a Weapon .....                          | 4-4  |
| Firing a Weapon .....                            | 4-4  |
| Embarking on a Vehicle .....                     | 4-5  |
| Disembarking from a Vehicle .....                | 4-5  |
| Parachuting .....                                | 4-6  |
| Tasking Other Entities .....                     | 4-6  |
| Disembark Entity .....                           | 4-7  |
| Follow Me .....                                  | 4-7  |
| Move to Location .....                           | 4-8  |
| Move to My Location .....                        | 4-8  |
| Suppress Location .....                          | 4-9  |
| Using the Radio .....                            | 4-10 |
| Turning on Your Flashlight .....                 | 4-10 |
| Changing Visual Sensors .....                    | 4-11 |
| Changing the Sensor for an LAV Crew Member ..... | 4-11 |
| Using the Binoculars .....                       | 4-11 |
| Opening and Closing Doors and Windows .....      | 4-12 |
| Operating the LAV and M1A2 .....                 | 4-12 |
| Using the Intercom .....                         | 4-13 |

## ***Controlling People and Ground Vehicles***

---

|                                                          |      |
|----------------------------------------------------------|------|
| The Gunner Role .....                                    | 4-13 |
| Commanding the LAV .....                                 | 4-13 |
| Driving the LAV and M1A2 .....                           | 4-13 |
| Driving Cars and Trucks .....                            | 4-15 |
| Pivoting a Tank .....                                    | 4-15 |
| Changing the View Mode .....                             | 4-16 |
| Resetting Humans and Ground Vehicles .....               | 4-16 |
| Starting VR-Forces Events .....                          | 4-17 |
| Support for the Oculus Rift HMD .....                    | 4-18 |
| Disabling Instancing .....                               | 4-18 |
| Configuring Ground Vehicles on Geocentric Terrains ..... | 4-19 |

## 4.1. Introduction

VR-Engage and VR-EngageGround let you control individual human characters and ground vehicles. VR-Engage includes models for a light armored vehicle (LAV) and M1A2 Abrams Main Battle Tank that use the Vortex physics libraries to control their movement.

## 4.2. Moving Your Character Around the Terrain

You can move your character around the terrain using the keyboard and game controller. You can look around using the keyboard, game controller, or mouse. You can increase and decrease the speed at which you move. For keyboard, mouse mapping, and game controller mappings, please see Chapter 6, [Mouse, Keypad, and Controller Mappings](#).



The Mode button switches the functions of the D-pad and the left thumbstick. Since it is easy to inadvertently press it, if you the D-pad and thumbstick are not working as expected, check the Mode button. It should be off (no green light).

---

## 4.3. Displaying the Action Menu

The Action menu lets you turn several features on and off and lets you assign tasks to other players if you are hosting a VR-Forces scenario or connected to a VR-Forces session. The Action menu is context-sensitive. It has the following options:

- ♦ Turn the flashlight on and off.
- ♦ Turn night vision goggles on and off.
- ♦ Turn the radio on and off.
- ♦ Interact with the terrain, such as opening and closing doors.
- ♦ Give a task to an entity.
- ♦ Start a VR-Forces event.
- ♦ Change the weapon.

**To display the Action menu, do either of the following:**

- ♦ Press ~.
- ♦ Press the menu button on your game controller (the Back button on the Logitech F310).

## 4.4. Choosing a Weapon

Infantry characters have a rifle and several types of grenades. Characters with an M9 in their name have an M9 pistol. Vehicles may have multiple weapons available. A graphic in the lower right corner of the screen shows the current weapon for humans ([Figure 4-1](#)). Information about the selected weapon for vehicles varies depending on the role and weapon.



Figure 4-1. Weapon icons for humans

### To choose a weapon:

1. Press tilde (~) or the Action menu button on your game controller. The Action menu opens ([Figure 4-1](#)).
2. On the Action menu, select Weapon.
3. Press the right arrow key or right button on the D-pad to cycle through the list of available weapons.



You can also cycle through the weapon list using the Select Weapon button on your game controller.

---

## 4.5. Firing a Weapon

### To fire a weapon, do any of the following:

- ♦ Press the **Spacebar**.
- ♦ Click the left mouse button.
- ♦ Use the fire button on your game controller.

## 4.6. Embarking on a Vehicle

If a vehicle supports embarkation, characters can embark on it and move with it as it moves. If the vehicle has interior geometry, your character can look around and walk around on the floor of the vehicle. Among the vehicles provided with VR-Engage, the 5-ton truck and the CH-47 Chinook and CH-149 Cormorant helicopters have interior geometry. The LAV and M1A2 support embarkation, but do not have interior geometry.

### To embark on a vehicle:

1. Have your character walk up to the vehicle. When the character is within a meter or so of the vehicle, the Embark menu is displayed ([Figure 4-2](#)).



Figure 4-2. Embark menu

2. Use the up and down arrow keys or the D-pad to select a role.
3. Press the right arrow key or right D-pad button to initiate the action. The character is placed on the vehicle.

## 4.7. Disembarking from a Vehicle

### To disembark from a vehicle, do any of the following:

- ♦ Have the character walk off the back of the vehicle.
- ♦ On the Action menu, choose Disembark. The character is placed off the back of the vehicle.

## 4.8. Parachuting

The paratrooper character can parachute out of aircraft (Figure 4-3). The descent starts in free fall. The paratrooper's weapon is hidden. After the parachute is deployed, the drift of the paratrooper is affected by wind speed and direction. You can turn the parachute to the left or right and you can slow the rate of descent. When the paratrooper lands, the parachute is hidden and the paratrooper's weapon is again available. It returns to whichever view mode it was in before it jumped.



Figure 4-3. Parachute deployed

- To jump from an aircraft, walk out of an open cargo door.
- To deploy a parachute, press **Spacebar** or the left thumbstick on your Gamepad.
- To turn left or right while the parachute is deployed, press **A** or **D** or buttons 5 and 6 on your Gamepad. (For a diagram of Gamepad buttons, please see “[Generic Gamepad Button Numbering](#),” on page 6-24.)
- To slow the rate of descent while the parachute is deployed, press **A** or **D** or buttons 5 and 6 at the same time.

## 4.9. Tasking Other Entities

While you are playing a character, you can assign tasks to other entities in the scenario.

### 4.9.1. Disembark Entity

The Disembark Entity task causes the selected entity to disembark from the vehicle that it is on.

**To issue the Disembark Entity task:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Task Entity.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Select Entity menu opens.
4. Select the entity that you want to give a task to.
5. Press the right arrow key, or the right button on the D-pad to show the submenu. The Task Entity menu opens.
6. Select Disembark Entity.
7. Press the right arrow key or right D-pad button to initiate the action.

### 4.9.2. Follow Me

The Follow Me task causes the selected entity to follow your character.



If you task an entity to follow you, it will do so indefinitely. To get it to stop following, task the entity to move to a location.

---

**To issue the Follow Me task:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Task Entity.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Select Entity menu opens.
4. Select the entity that you want to give a task to.
5. Press the right arrow key, or the right button on the D-pad to show the submenu. The Task Entity menu opens.
6. Select Follow Me.
7. Press the right arrow key or right D-pad button to initiate the action. The entity moves to a location behind your character.

### **4.9.3. Move to Location**

The Move to Location task causes the selected entity to move to the specified location.

**To issue the Move to Location task:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the D-pad buttons to select Task Entity.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Select Entity menu opens.
4. Select the entity that you want to give a task to.
5. Press the right arrow key, or the right button on the D-pad to show the submenu. The Task Entity menu opens.
6. Select Move to Location. VR-Engage places a waypoint symbol at the point your character is looking at.
7. Press and hold the right mouse button or use the right thumbstick on your Gamepad to move the waypoint to the location you want the other entity to move to.
8. Press the right arrow key or the right button of the D-pad to initiate the task. The tasked entity moves to the location.
9. Close the Action menu.

### **4.9.4. Move to My Location**

The Move to My Location task causes the selected entity to move so that it is standing next to your character.

**To issue the Move to My Location task:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Task Entity.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Select Entity menu opens.
4. Select the entity that you want to give a task to.
5. Press the right arrow key, or the right button on the D-pad to show the submenu. The Task Entity menu opens.
6. Select Move to My Location.
7. Press the right arrow key or right D-pad button to initiate the action. The selected entity moves to a position next to your character.

### **4.9.5. Suppress Location**

The Suppress Location task causes the selected entity to fire on the specified location to suppress any entities at that location.

**To issue the Suppress Location task:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Task Entity.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Select Entity menu opens.
4. Select the entity that you want to give a task to.
5. Press the right arrow key, or the right button on the D-pad to show the submenu. The Task Entity menu opens.
6. Select Suppress Location. VR-Engage places a waypoint symbol at the point your character is looking at.
7. Press and hold the right mouse button or use the right thumbstick on your Gamepad to move the waypoint to the location you want the other entity to suppress.
8. Press the right arrow key or the right button of the D-pad to initiate the task. The tasked entity fires at the location.

## 4.10. Using the Radio

VR-Engage supports voice communications over radios and intercoms. You can communicate with other players in your force. Individual human players have a 2-channel radio. The LAV has a 2-channel radio and an intercom. The intercom allows the LAV crew to communicate among themselves.

Radio communications are perfect. Radio signals are not affected by terrain, weather, distance, or other factors.

The radio uses the default audio device for capture and playback. The default device must be selected for both capture and playback in the Windows audio settings dialog box.

For information about the intercom, please see [“Using the Intercom,”](#) on page 4-13.

### To use the radio:

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Radio.
3. Press the right arrow key, or the right button on the D-pad to select a channel (Radio 1 or Radio 2).
4. To talk, hold down the **t** key. To hear others, release the key.

## 4.11. Turning on Your Flashlight

The flashlight casts a circle of light on the terrain.

### To turn on the flashlight:

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Flashlight.
3. Press **f**, the right arrow key, or the right button on the D-pad to toggle the flashlight on or off.

## 4.12. Changing Visual Sensors

Human characters and the LAV driver can simulate the effect of wearing night vision goggles (NVG). The LAV commander and gunner can use the NVG sensor and infrared (IR) white-hot and black-hot.

### i

---

The default visual sensors use CameraFX, which just applies a filter to the scene. It does not take into account the materials of the viewed objects. For details, please see *VR-Vantage Users Guide*.

If you want a visual sensor capability that takes into account the materials of the viewed objects, you can install SensorFX. SensorFX is an extra cost option. Please contact [info@mak.com](mailto:info@mak.com) for details.

---

#### To turn on the night vision goggles for human characters:

1. Press **~**. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Night Vision.
3. Press **n**, the right arrow key, or the right button on the D-pad to toggle the night vision on or off.

### 4.12.1. Changing the Sensor for an LAV Crew Member

Changing the sensor mode is the same for all crew members. The only difference is that the commander and gunner have more sensors to cycle through.

- To change the sensor for an LAV crew member, press the right thumbstick until you see the sensor that you want.

## 4.13. Using the Binoculars

You can zoom in and out in five fixed steps. At the highest zoom level (binoculars), VR-Engage displays a range finder graphic.

#### To zoom the view in and out, do any of the following:

- ♦ Scroll the mouse wheel forward and back.
- ♦ Press **=** to zoom in, **-** to zoom out.
- ♦ Press **b** (for binoculars view).
- ♦ On the Action menu, select Binoculars and change the status.

You cannot fire a weapon when the binoculars are in use. If you are controlling a character that has lasing capability, pressing the Fire button lases the target.

## 4.14. Opening and Closing Doors and Windows

If a terrain has doors and windows that can open and close, when a human character approaches within about a meter of an opening, a menu is displayed that lets you choose to open or close the opening ([Figure 4-4](#)).



Figure 4-4. Door menu

- To open or close a door or window, when the appropriate menu is displayed, make a selection from the menu.

## 4.15. Operating the LAV and M1A2

To operate the LAV or M1A2, you must use a game controller or racing wheel controller.



The M1A2 supports the driver and gunner roles. Game controller mappings are the same as for the LAV, except as noted in [“Logitech Gamepad Mappings for the LAV and M1A2,”](#) on page 6-6.

---

#### **4.15.1. Using the Intercom**

Players who are embarked on the LAV, can communicate using the intercom. The intercom is voice activated and transmits any sound that is greater than the VOX threshold.

**To use the intercom:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Radio.
3. Press the right arrow key, or the right button on the D-pad to select Intercom.
4. Start talking.

#### **4.15.2. The Gunner Role**

The gunner can:

- ♦ Fire the gun.
- ♦ Rotate and elevate the gun.
- ♦ Zoom in and out.
- ♦ Change the sensor.

#### **4.15.3. Commanding the LAV**

The LAV commander has fairly limited capabilities. Commanders can rotate the camera to look around, zoom in and out, and change the sensor view. Commanders can also communicate with other crew members and other players using the intercom or radio.

#### **4.15.4. Driving the LAV and M1A2**

The LAV and M1A2 driver can:

- ♦ Drive the vehicle, which involves:
  - Starting the engine.
  - Engaging gears.
  - Increasing and decreasing throttle.
  - Steering.
- ♦ Managing headlights.
- ♦ Rotate the turret. (You can't see this happen in first person mode.)
- ♦ Fire the gun.

## **Starting the Engine**

**To start the engine, do one of the following:**

- On the Action menu, toggle Engine Start.
- On the Gamepad F310, press the Start button.
- On the G27 Racing Wheel Controller, press the Engine On button.

## **Putting the Vehicle into Gear**

The LAV and M1A2 have eight forward gears and six reverse gears.

- To put the vehicle into gear, press the Gear Up or Gear Down buttons on your gaming controller.

## **Throttle Control**

If you are driving using a G27 Racing Wheel Controller, use the gas and brake pedals.

- To move the vehicle, press the throttle control (left thumbstick on the Gamepad) forward.
- To brake the vehicle, pull the throttle control backwards.

## **Steering the Vehicle**

- To steer the vehicle, use the right thumbstick on a Gamepad or the steering wheel of the racing wheel controller.

## **Releasing and Engaging the Parking Brake**

**To set the parking brake on or off:**

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select P Break On/Off.
3. Press the right arrow key, or the right button on the D-pad to toggle the setting.

## **Locking and Unlocking the Differential (LAV Only)**

A differential allows the wheels on an axle to rotate at different speeds. Locking the differential may improve traction under certain terrain conditions.

**To lock or unlock the differential, do one of the following:**

- On the Action menu, toggle Diff Lock On/Off.
- On the Gamepad F310, press the X button.
- On the G27 Racing Wheel Controller, press the Differential Gear button.

### **Turning the Headlights On and Off**

**To turn on headlights, do one of the following:**

- ♦ On the Action menu, toggle Headlight On/Off.
- ♦ On the Gamepad F310, press the A button.
- ♦ On the G27 Racing Wheel Controller, press the Lights button.

## ***4.16. Driving Cars and Trucks***

VR-Engage includes several Vortex-enabled cars and trucks, such as a sedan, ambulance, police car, HMMWV, and 5-ton truck. They all support the driver role. They use the same controller mappings for driving as the LAV and M1A2. You can start the engine, put it in gear, and drive it. You can also turn headlights on and off. For a diagram of Gamepad mappings, please see [“Logitech Gamepad Mappings for Cars and Trucks,”](#) on page 6-9.

## ***4.17. Pivoting a Tank***

Most controls for driving an M1A2 tank are the same as for driving an LAV. (For details, please see [“Driving the LAV and M1A2,”](#) on page 4-13.) The only procedure particular to tanks is pivoting.

**To pivot a tank:**

1. Start the engine.
2. Press the left thumbstick on the Gamepad. The text Pivot Enabled is added to the engine information overlay in the lower left corner of the screen.
3. Put the tank in gear and begin driving.
4. Use the right thumbstick to pivot left or right.

## 4.18. Changing the View Mode

By default, when you assume a role, you are in first person mode. That is, the eyepoint is placed as if you were looking out of the eyes of a human character or from the appropriate position of a character in a vehicle, such as the driver. You can switch to third person mode so that you can see the character you are playing in its context in the terrain.

If you are driving a vehicle, you may have several views of the vehicle from different angles available.

**To change the view mode, do one of the following:**

- ♦ For human characters, press the B button on the Gamepad.
- ♦ For human characters, press 1 for first-person mode; press 3 for third-person mode.
- ♦ For the LAV or M1A2 driver, press the Y button on the Gamepad.

## 4.19. Resetting Humans and Ground Vehicles

You can reset humans and ground vehicles. When you reset an object, it returns to full health and restores all resources, such as ammunition or fuel. There are two types of reset, as follows:

- ♦ Reset. Restores the entity and returns it to the location it had when you took control. If you are controlling a human entity that disembarked from a vehicle role, it resets to the location at which it disembarked.
- ♦ Reset in Place. Restore the entity at its current location.

**To reset a human or ground vehicle, use one of the following methods:**

- ♦ On the Action menu, select Reset or Reset in Place.
- ♦ On the keyboard, press **F5** (Reset) or **CTRL+F5** (Reset in Place). (Humans only.)

## 4.20. Starting VR-Forces Events

VR-Forces scenarios can include scenario events, which can consist of text, audio, video, graphics, or some combination of these. A scenario event represents an incident or condition that exercise participants can respond to, for example a political event, a natural disaster, or some other novel event that might require a participant to respond.

If you are controlling a character in a VR-Forces scenario and the scenario has scenario events, you can trigger them. The scenario events are displayed in the VR-Forces front-end. They are not displayed in the VR-Engage window. If VR-Engage is hosting a scenario (and there are no VR-Forces front-ends in the exercise), the events are listed on the Action menu, but triggering them may have no visible effect.

The Action menu lists all of the events that have been created for the scenario, but does not indicate their status. A VR-Engage character can only start an event. If an event is active, you cannot stop it from VR-Engage.

### To start a scenario event:

1. Press ~ or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the up and down buttons on the D-pad to select Trigger Event.
3. Press the right arrow key, or the right button on the D-pad to display a list of events.
4. Press the up or down arrow key, or the up or down button on the D-pad to select the event you want to trigger.
5. Press the right arrow key, or the right button on the D-pad to trigger the event.

## 4.21. Support for the Oculus Rift HMD

VR-Engage includes limited support for the Oculus Rift Virtual Reality Device. It has only been tested with human entities.

Use of the Oculus HMD has the following limitations:

- To select a character, you must select it in the Change Role Panel.
- You cannot place a new character. You can only use an existing character from a scenario.
- There is no Head up Display showing ammo, posture, or current weapon in the Oculus.
- You must disable high dynamic range (HDR) lighting when using the Oculus.

Once you are wearing the Oculus and in your normal sitting position, you must reset the view by pressing the – (minus) key on the keypad. This resets the view of the Oculus to the default head position of the character.

Due to the nature of virtual reality, some terrains perform better than others. Performance is critical to a good experience. Proper hardware and terrain performance tuning will be required.

- To start VR-Engage with the Oculus enabled, choose **VR-Engage with Oculus Rift** on the Start menu, or run `.\\bin64\\vrEngageGroundWithOculus.bat`.

### 4.21.1. Disabling Instancing

When running with the Oculus, you may observe some unexpected shininess of objects in the direction you are looking. There is a known problem using the Oculus when instancing is enabled. The workaround is to disable instancing in the application.

**To disable instancing:**

1. Choose **Settings** → **Display**. The Display Settings dialog box opens.
2. Select the DI-Guy Settings page.
3. Clear the Enable Instancing check box.

## 4.22. Configuring Ground Vehicles on Geocentric Terrains

VR-Engage ground vehicles use the Vortex physics libraries for their movement systems. When a vehicle moves on a geocentric terrain, VR-Engage must convert the geocentric coordinates to a flat earth coordinate system. The conversion is based on a user-defined origin that, ideally, represents the location where the majority of simulation activity will take place. As vehicles move further away from the origin, projection errors can occur. When distances from the origin exceed several hundred kilometers, the projection error may be noticeable and vehicles may drift from their expected line of movement.

To resolve this problem, you should set the origin to a location that is close to the location where you are simulating vehicles. For example, VR-Engage sets the origin to Honolulu, Hawaii, USA, the location of the terrain we use for our demonstration scenarios. If you want to simulate in some other location in the world, you should set the origin differently.

To set the origin, specify values for the `coordinateConverterOrigin` parameter in `.appData/scripts/vortexTerrainConfig.lua`. The values are in decimal degrees for latitude and longitude and meters for elevation. If the parameter is not specified, the default values are 0,0,0.

This parameter is only used for geocentric terrains. For projected terrains, the terrain data is used directly and no conversion is needed.





## 5. Controlling Aircraft

This chapter explains how to fly aircraft using VR-Engage.

|                                                 |      |
|-------------------------------------------------|------|
| Introduction .....                              | 5-2  |
| The Head-Up Display .....                       | 5-3  |
| The Instrument Panel .....                      | 5-3  |
| Aircraft Display Options .....                  | 5-6  |
| Taking Control of an Aircraft .....             | 5-6  |
| Bombing Targets .....                           | 5-7  |
| Targeting a Bomb Using a Laser Code .....       | 5-7  |
| Air-to-Air Combat .....                         | 5-8  |
| Resetting Aircraft .....                        | 5-10 |
| Requesting SAR Images from RadarFX Server ..... | 5-10 |
| Requesting a SAR Image .....                    | 5-11 |
| Configuring a SAR Request .....                 | 5-11 |
| Configuring Additional Aircraft .....           | 5-16 |

## **5.1. Introduction**

VR-Engage and VR-Engage Air let you control fixed-wing aircraft and rotary-wing aircraft. VR-Engage uses the RotorLib and FixedWingLib libraries to provide realistic aircraft behaviors and controls. VR-Engage includes mappings for the Thrustmaster Hotas Warthog flight controller, the T.Flight Hotas X flight controller, and the Gamepad F310 and F710.

When you are flying an aircraft, you have an out-the-window head-up display (HUD) and an instrument panel. Using two monitors will let you view both displays at the same time.

The following types of aircraft are available to control out-of-the-box:

- ♦ F/A-18 Hornet
- ♦ F-16A Fighting Falcon
- ♦ F-35 Lightning II
- ♦ MiG-29 Fulcrum
- ♦ AH-64A Apache
- ♦ CH-149 Cormorant
- ♦ CH-47 Chinook
- ♦ UH-60 Blackhawk.

You can add more aircraft. For details, please see [“Configuring Additional Aircraft,”](#) on page 5-16.

### 5.1.1. The Head-Up Display

The head-up display (HUD) provides an out-the-window view with an overlay showing speed, altitude (R = above ground level; A = above mean sea level), heading.

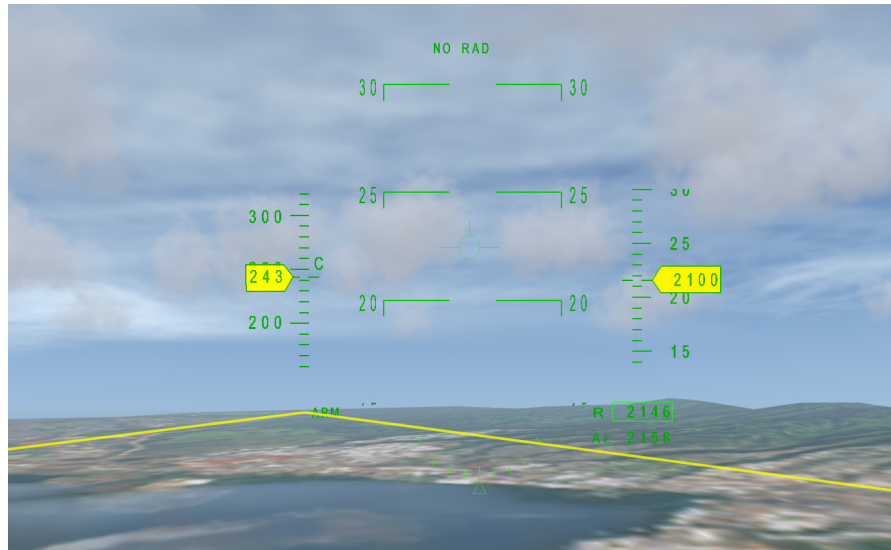


Figure 5-1. HUD (2 Screen display)

### 5.1.2. The Instrument Panel

The instrument panel (Figure 5-2) has six gauges and four multi-function displays (MFD).



The instrument panel is an independent window. You can minimize and maximize it. If you are using one monitor, it may get hidden behind the HUD. If that happens, press **Alt+Tab** to bring it to the front.

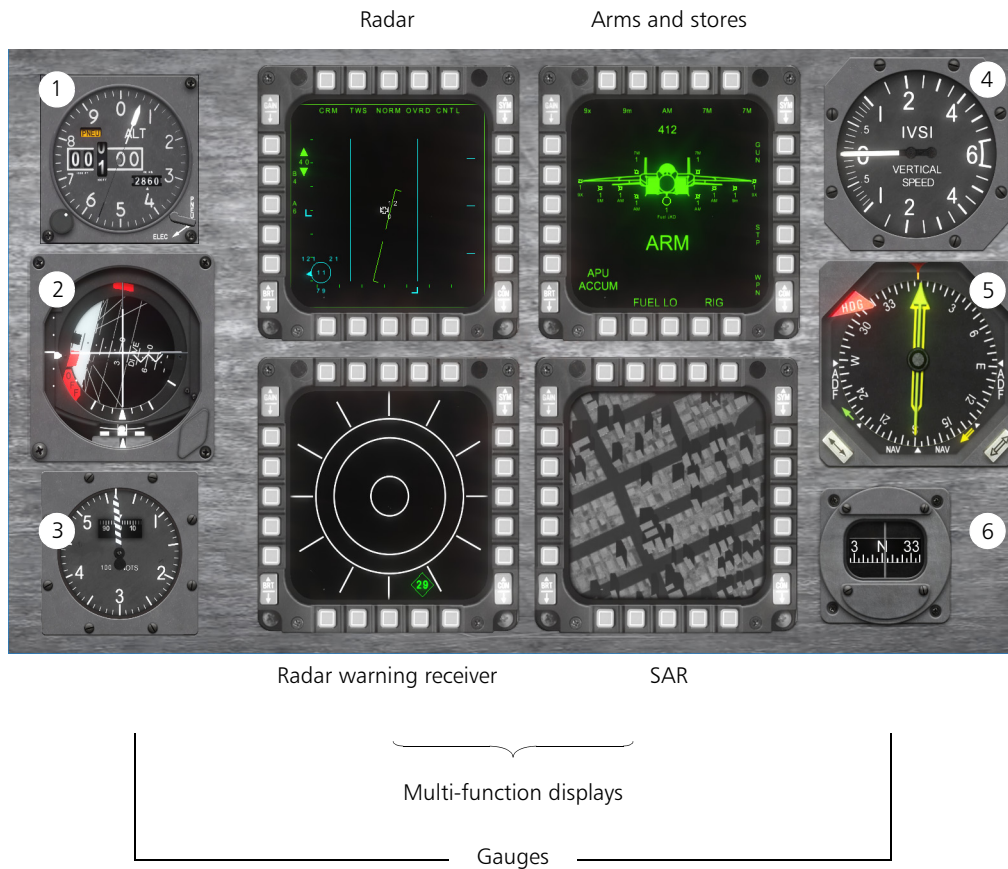


Figure 5-2. Instrument panel (2 Screen display)

The gauges are:

- ♦ 1 – Altimeter.
- ♦ 2 – Attitude Indicator (Artificial Horizon).
- ♦ 3 – Airspeed Indicator.
- ♦ 4 – Vertical Speed Indicator.
- ♦ 5 – Heading Indicator.
- ♦ 6 – Compass.

The MFDs are:

- ♦ Tactical Situation Display (Radar Indicator).
- ♦ Weapons/Stores Control Panel.
- ♦ Synthetic Aperture Radar (SAR) view.
- ♦ Radar Warning Receiver. Shows entities that are detecting you on their radar. The rings show the effective threat range.
- ♦ Visual Sensor Display. Displays the view from the gimbaled sensor or a plan view display of the scenario.

### Changing the Multi-Function Display

Each MFD window can display any of the possible display types.



Figure 5-3. Multi-function display

- To change the display, click one of the buttons along the bottom of the display.



If the instrument panel does not respond when you click a button, it might not have focus. Click it a few times or expand the window to gain focus.

### 5.1.3. Aircraft Display Options

VR-Engage has the following options for displaying the head-up display and instruments panel:

- ♦ 1 Screen Landscape. Head-up display and instrument panel are integrated in one window, optimized for a single monitor in landscape (horizontal) orientation.
- ♦ 1 Screen Portrait. Head-up display and instrument panel are integrated in one window, optimized for a single monitor in portrait (vertical) orientation.
- ♦ 2 Screen. The Head-up display and instrument panel are in separate windows. If you have two monitors you can move the instrument panel into the second monitor to see both displays at the same time. If you choose this option and are using one monitor, the head-up display is full screen and the instrument panel is in a separate window (which might be hidden behind the head-up display). (You can configure the size of the instrument panel window, including setting it to be fullscreen, but editing the instrumentPanels block in `.\appData\scripts\playerDefinitions\pilot.lua`.)

**To choose an aircraft display option:**

1. In the Choose Role panel, select the aircraft you want to control.
2. In the Display(s) list, select the display option.

## 5.2. Taking Control of an Aircraft

To take control of an aircraft, you select it in the Choose Role panel, just as you would for a human character or a vehicle.

You can only take control of fixed-wing aircraft that are in the air. You cannot take off or land fixed-wing aircraft.



You must start flying the aircraft as soon as you click Engage. Even though it may take several seconds or longer to display the HUD and instrument panel, the aircraft is already flying. If you take control of an aircraft that is close to the ground, such as a low flying helicopter, there is a risk that it could crash before the HUD is available if you do not immediately maintain its altitude.

---

## 5.3. Bombing Targets

You can drop a bomb at any time. By default, bombs try to hit wherever the sensor view is looking at. You can specify a target using MGRS coordinates, or you can lase the target and look at the location being lased. (Lasing can be done by a VR-Forces entity or a VR-Engage character.) For lased targets, you can look at the target once, or you can continuously track what the laser is targeting.

MGRS coordinates must specify a zone, a grid, and an x, y offset. The x and y offsets must be the same number of digits. For example, a code of 04QFJ190557 would be built from:

- ♦ Zone: 04Q.
- ♦ Grid: FJ.
- ♦ X offset: 190.
- ♦ Y offset: 557.

In VR-Engage, if you change the coordinate system to MGRS (Display Settings dialog box, Measurement Units page), the 3D entity label for an entity (windowed mode, 3D view) displays its location in MGRS coordinates. You can then use this value to specify the coordinates for dropping a bomb. To get the MGRS coordinates for a tactical graphic, you can view the state data in VR-Forces.

For more information about MGRS coordinates, please see relevant pages available on the Internet.

### **To drop a bomb using MGRS coordinates:**

1. Press **1**. The MGRS Coordinates dialog box opens.
2. Type the coordinates you want to target.
3. Click OK.
4. Press the trigger to drop the bomb.

### 5.3.1. Targeting a Bomb Using a Laser Code

You must know the laser code as part of the scenario setup of interaction among participants. There is no way to find it out at runtime. When the aircraft detects a laser code, it displays it in the HUD.

### **To set the laser code without tracking the target:**

1. Press **2**. The Instantaneous Laser Track dialog box opens.
2. Type the laser code you are looking for.
3. Click OK.
4. Press the trigger to drop the bomb.

**To set the laser code and track the target continuously:**

1. Press **3**. The Continuous Laser Track dialog box opens.
2. Type the laser code you are looking for.
3. Click OK.
4. Press the trigger to drop the bomb.

## **5.4. Air-to-Air Combat**

To fire a missile at another aircraft, you must have a valid target in the Radar Indicator ([Figure 5-4](#)). A blue cursor along the bottom of the Radar Indicator shows when the radar is scanning. Yellow icons indicate detected targets.

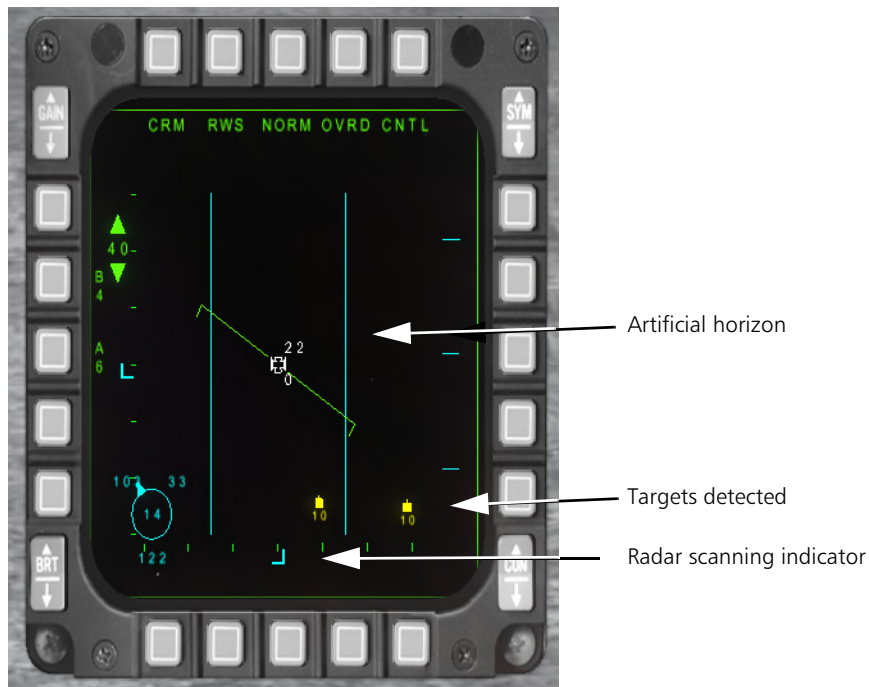


Figure 5-4. Radar Indicator

You may also see targets as green diamonds on the HUD ([Figure 5-5](#)).



Figure 5-5. Targets in HUD

Select the target using the cursor select controls. Once you have locked on a target (Figure 5-6), you can fire a missile at it. You can tell you have locked on a target when the following things happen in the Radar Indicator:

- ♦ The target icon becomes an outline instead of being solid.
- ♦ The radar scanning indicator tracks the target instead of sweeping back and forth.
- ♦ The gates (the two vertical lines in the Radar Indicator) are no longer displayed.



Figure 5-6. Radar lock

## 5.5. Resetting Aircraft

You can reset aircraft. When you reset an object, it returns to full health and restores all resources, such as ammunition or fuel. When you reset an aircraft it is restored and placed at the location where you took control of it.

**To reset an aircraft, use one of the following methods:**

- ♦ On the Action menu, select Reset.
- ♦ On the keyboard, press **F5**.

## 5.6. Requesting SAR Images from RadarFX Server

VR-Engage can request synthetic aperture radar (SAR) images from RadarFX Server. To use this feature, you must install a licensed version of RadarFX Server.

When you request an image, the server returns the image and it is displayed in the multi-function display window of an aircraft's instrument panel.

### 5.6.1. Requesting a SAR Image

When you request a SAR image, VR-Engage sends the request using the settings configured in the SAR Request Settings dialog box.

You can request an image from the RadarFX menu. You can also request an image using your game controller.



RadarFX Server must be running when you request a SAR image.

---

- To request an image from the RadarFX menu, choose **RadarFX** → **Request SAR Image**. To request an image using your game controller, press the appropriate button, as listed in “[Flight Controllers](#),” on page 6-10.



You can also request an image from the SAR Request Settings dialog box.

---

### 5.6.2. Configuring a SAR Request

When you request a SAR image, you must specify:

- ♦ The location of the sensor.
- ♦ The area of interest.
- ♦ The amount power the SAR system should use.

You can also configure the properties of the image that will be returned.

#### Specifying the Location of the Sensor

You must tell the server where the sensor that will take the image is located. You can:

- ♦ Use the location of the VR-Engage’s observer. This option is most useful when both the server and the client are running on the same machine and you can manually move the observer into position and then request a radar image.
- ♦ Attach to an entity in the simulation. VR-Engage must be connected to a session and an entity must be selected in the Choose Role Panel.
- ♦ Enter a location manually in latitude, longitude, and altitude.

#### To specify a location:

1. Choose **RadarFX** → **SAR Settings**. The SAR Request Settings dialog box opens.
2. Select the Request tab ([Figure 5-7](#)).

The screenshot shows the 'SAR Request Settings' dialog box with the 'Request' tab selected. The dialog has three tabs: 'Request', 'Settings', and 'Connection'. The 'Request' tab contains two main sections: 'Sensor Location' and 'Area of Interest'. Each section has three radio button options: 'Use Simulated Entity Location', 'Use Observer Location' (selected in both), and 'Set Location Manually'. Below the radio buttons are dropdown menus for 'Entity Name' and 'Observer Name' (both showing 'No Valid Entities'), and 'Sensor Name' (showing 'No Valid Sensors'). Below these are three input fields for 'Latitude (deg)', 'Longitude (deg)', and 'Altitude (meters)', all showing '0.000000'. At the bottom of the dialog is a 'Request SAR Image' button.

Figure 5-7. SAR Request Settings, Request tab

3. In the Sensor Location group box, choose one of the options.
4. If you choose Use Simulated Entity Location, select an entity in the Entity Name list.

If you choose Use Observer Location, select an observer in the Observer Name list.

If you choose Set Location Manually, specify Latitude, Longitude, and Altitude.

### Specifying the Area of Interest

The area of interest is the area that you want to take an image of. You can specify the area of interest as:

- ♦ An area centered on an entity.
- ♦ An area centered on the ownship vehicle's Targeting Pod.
- ♦ An area centered on a mouse click on the terrain.
- ♦ An area centered on a specified latitude and longitude.

The cross range and down range values specify the size, in meters, of the area of interest centered on the target location, as illustrated in [Figure 5-8](#).

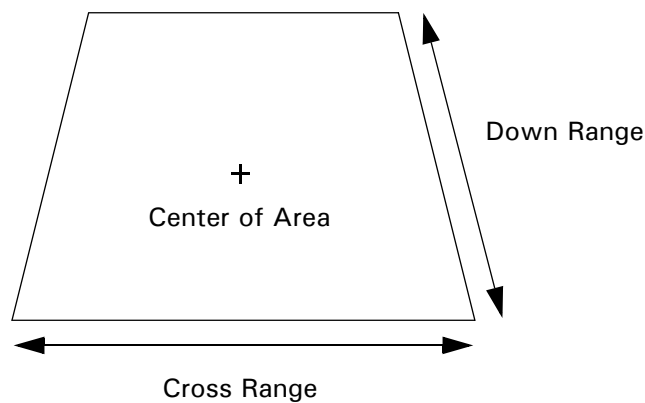


Figure 5-8. Area of interest

#### To specify the area of interest:

1. Choose **RadarFX** → **SAR Settings**. The SAR Request Settings dialog box opens.
2. Select the Request tab ([Figure 5-7](#)).
3. In the Area of Interest group box, select an option.
4. If you choose Set Area of Interest by Mouse Click, click on the terrain to set the center of the area of interest.

If you choose Use Simulated Entity Location, select an entity in the Entity Name list.

If you choose Use Ownship Entity Sensor Field of View, select the sensor to use in the Sensor Name list.

If you choose Set Location Manually, specify Latitude, Longitude, and Altitude.

5. Select the Settings tab ([Figure 5-9](#)).

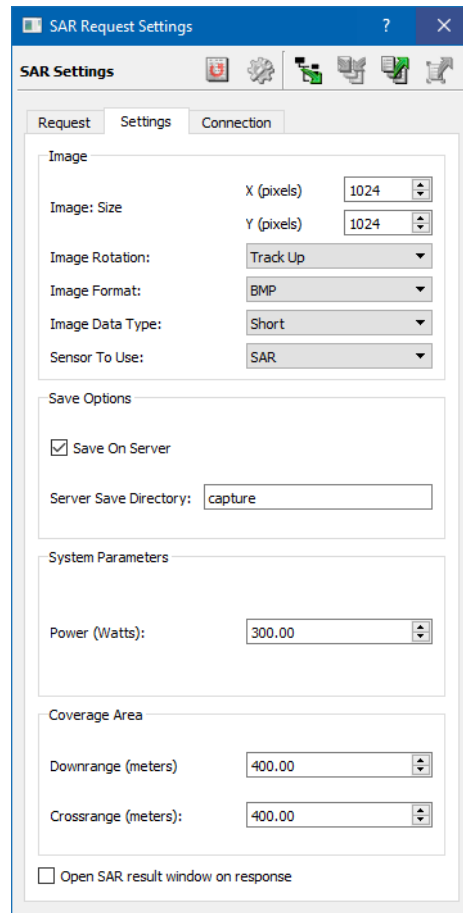


Figure 5-9. SAR Request Settings, Settings tab

6. In the Coverage Area group box, specify the Downrange and Crossrange values.

### Specifying the Power

The power value is the amount of power that the SAR system should use to generate the image. Higher power levels increase the image gain. Lower levels result in a darker image.

#### To specify the power

1. Choose **RadarFX** → **SAR Settings**. The SAR Request Settings dialog box opens.
2. Select the Settings tab (Figure 5-9).
3. In the System Parameters group box, enter a value in the Power box.

### **Configuring Image Properties**

You can specify the properties of the image that the server returns. You can also specify that the image be saved on the server. You can specify the following properties:

- ♦ Image size, in pixels.
- ♦ Image Rotation. The image can be rotated so that North is up or the sensor's view is up.
- ♦ Image Format. Options are PNG, JPG, BMP, Raw, and NITF (National Imagery Transmission Format).
- ♦ Image Data Type. Byte, short, or float.

#### **To specify image properties:**

1. Choose **RadarFX** → **SAR Settings**. The SAR Request Settings dialog box opens.
2. Select the Settings tab ([Figure 5-9](#)).
3. In the Image group box, change properties as desired.
4. To save the image on the server, in the Save Options group box, select Save On Server. Specify the directory in which to save images.

## 5.7. Configuring Additional Aircraft

“[Introduction](#),” on page 5-2 lists the aircraft that you can control using VR-Engage. You can use the VR-Forces Simulation Object Editor to add additional aircraft that you can control. This procedure assumes you are familiar with the Simulation Object Editor. For details about how to use it, please see *VR-Forces Users Guide*.



If you do not already have VR-Forces, please contact your MAK salesperson (info@mak.com) to get a copy to use for this purpose.

---

Fixed-wing aircraft and rotary-wing aircraft use different OPE files and movement libraries. However, the general procedure for adding new aircraft is the same for both types.

The aircraft that are already configured for VR-Engage have parameters in their *.entity* files that other aircraft do not have.

All aircraft (fixed-wing and rotary-wing) have the following parameters:

- `<bool paramName="vrenge-controllable">True</bool>`
- `<stringList paramName="vrenge-station-names">"Pilot"</stringList>`
- `<stringList paramName="vrenge-station-labels">"Pilot"</stringList>`

Fixed-wing aircraft have the following parameters:

- `platform="@platforms-dir)/FWL_Fixed_Wing_Aircraft.ope"`
- `<componentSystem systemName="movement" platform="@system-dir)/movement/fixed-wing-high-maneuverability-fighter-FWL.sysdef">`

Rotary-wing aircraft have the following parameters:

- `platform="@platforms-dir)/RL_Rotary_Wing_Aircraft.ope"`
- `<componentSystem systemName="movement" platform="@system-dir)/movement/rotary-wing-heavy-RL.sysdef">`

### To configure an aircraft entity:

1. Be sure that you have installed the VR-Forces add-ons for VR-Engage. (For details, please see “[Installing the VR-Forces Plug-in](#),” on page 2-3.)
2. Start the Simulation Object Editor.
3. Load *EntityLevel.sms*.
4. Select a fixed-wing or rotary-wing aircraft entity that you know is configured for control by VR-Engage. (See the list in “[Introduction](#),” on page 5-2.)
5. Choose **Model** → **New Model from Existing**. The Create New Model dialog box opens.
6. Give the new model a name.

7. Optionally, edit the entity type.
8. Click OK.
9. Edit the parameters of the new entity, including the short name and the 2D and 3D models to use.
10. Add or remove systems as desired.
11. For fixed-wing aircraft, configure the FixedWingLib parameters. These are the parameters used when VR-Engage controls the entity. If you are creating a fighter, set Aircraft Configuration File to `..\data\RTDynamics\FixedWingLibCGF\GenericFighter.rtdcfg`. If you are creating a UAV, set it to `..\data\RTDynamics\FixedWingLibCGF\GenericFixedWingUAVJet.rtdcfg`.  
  
For rotary-wing aircraft, configure the RotorLib parameters. Set the Helicopter Configuration File to `..\data\RTDynamics\RotorLibCGF\GenericHeavyHelicopter.rtdcfg`.
12. Save the SMS.
13. Optionally, edit VR-Forces movement parameters that are not available for editing in the Simulation Object Editor. If you select an entity that is not configured for use with the FixedWingLib or RotorLib movement system, you will see that it has many parameters that were not available when you configured your new entity, such as mass, maximum speed, ordered speed, and so on. These parameters affect how the entity behaves when controlled from VR-Forces, rather than from VR-Engage. If you want to change any of these parameters, you can do so by editing the entity's `.entity` file directly.
14. Copy the `.entity` file for your new entity to `./data/simulationModelSets/EntityLevel/vrfSim` in your VR-Engage directory.





## 6. Mouse, Keypad, and Controller Mappings

This chapter describes mouse and keyboard mappings and controller mappings for VR-Engage. For details about configuration additional controllers, please see “[Configuring Joysticks and Keyboard Control](#),” on page 6-25.

|                                                                  |      |
|------------------------------------------------------------------|------|
| Mouse and Keyboard Mappings .....                                | 6-2  |
| Enabling and Disabling Mouse Control .....                       | 6-3  |
| Logitech Gamepad Mappings for Human Control .....                | 6-4  |
| Logitech Gamepad Mappings for Using the Action Menu .....        | 6-5  |
| Logitech Gamepad Mappings for the LAV and M1A2.....              | 6-6  |
| G27 Racing Wheel Controller .....                                | 6-8  |
| Logitech Gamepad Mappings for Cars and Trucks .....              | 6-9  |
| Flight Controllers .....                                         | 6-10 |
| Thrustmaster HOTAS Warthog Mappings for Fixed-Wing Entities .... | 6-10 |
| Thrustmaster HOTAS Warthog Mappings for Rotary-Wing Entities ..  | 6-13 |
| T.Flight Hotas X Mappings for Fixed-Wing Entities.....           | 6-15 |
| T.Flight Hotas X Mappings for Rotary-Wing Entities.....          | 6-18 |
| Gamepad Flight Control Mappings for Fixed-Wing Entities.....     | 6-21 |
| Gamepad Flight Control Mappings for Rotary-Wing Entities.....    | 6-23 |
| Generic Gamepad Button Numbering.....                            | 6-24 |
| Configuring Joysticks and Keyboard Control.....                  | 6-25 |
| Creating a Joystick Configuration .....                          | 6-25 |
| Mapping the Joystick Stick.....                                  | 6-27 |
| Mapping Joystick Buttons and Keyboard Keys .....                 | 6-28 |
| Configuring “Switch Between” Options.....                        | 6-31 |

## 6.1. Mouse and Keyboard Mappings

Table 6-1 lists mouse and keyboard mappings for human players.

Table 6-1: Human player mouse and keyboard controls

| Mouse Mappings                                             |                                                                |
|------------------------------------------------------------|----------------------------------------------------------------|
| Turn and move weapon                                       | Mouse move                                                     |
| Fire                                                       | Left mouse button                                              |
| Zoom in                                                    | Mouse wheel forward                                            |
| Zoom out                                                   | Mouse wheel backward                                           |
| Aim                                                        | Right mouse button                                             |
| Keyboard Mappings                                          |                                                                |
| Toggle full screen                                         | CTRL + ENTER                                                   |
| Stop playing                                               | ESC                                                            |
| Toggle Action menu                                         | ~                                                              |
| First-person mode                                          | 1                                                              |
| Third-person mode                                          | 3                                                              |
| Reset to starting position (the scenario continues to run) | F5                                                             |
| Reset in current position (the scenario continues to run)  | CTRL + F5                                                      |
| Move forward                                               | W                                                              |
| Move backward                                              | S                                                              |
| Strafe left                                                | A                                                              |
| Strafe right                                               | D                                                              |
| Yaw left                                                   | Left arrow                                                     |
| Yaw right                                                  | Right arrow                                                    |
| Toggle 1st and 3rd person                                  | C. Aircraft only and only when using HOTAS Warthog controller. |
| Posture up                                                 | Q                                                              |
| Posture down                                               | E                                                              |
| Sprint                                                     | SHIFT + W                                                      |
| Fire                                                       | SPACE                                                          |
| Aim                                                        | M                                                              |
| Talk on the radio                                          | T                                                              |
| Pitch weapon up                                            | Up arrow                                                       |
| Pitch weapon down                                          | Down arrow                                                     |

Table 6-1: Human player mouse and keyboard controls

|                             |   |
|-----------------------------|---|
| Toggle night vision goggles | N |
| Binoculars                  | B |
| Zoom in                     | = |
| Zoom out                    | - |
| Toggle flashlight           | F |

[Table 6-2](#) lists keyboard controls for the Action menu.

Table 6-2: Action menu mouse and keyboard mappings

| Mouse Mappings          |                      |
|-------------------------|----------------------|
| Select menu item        | Mouse move           |
| Keyboard Mappings       |                      |
| Next menu item          | Up arrow             |
| Previous menu item      | Down arrow           |
| Select menu item        | Right arrow or Enter |
| Return to previous menu | Left arrow           |

### 6.1.1. Enabling and Disabling Mouse Control

When mouse control is enabled, you can use the mouse to turn a character, fire, and other actions. When it is disabled, you can access menus (in windowed mode) and do other typical mouse actions.

When you take control of a character, mouse control is automatically enabled. When you switch to windowed mode, it is automatically disabled. You can toggle mouse control on and off at any time in both fullscreen mode and windowed mode. (For information about windowed mode, please see [“Playing in Windowed Mode,”](#) on page 3-13.)

- To enable or disable mouse control, press **Alt + Enter**. You can also enable mouse control by double-clicking in the window.

## **6.2. Logitech Gamepad Mappings for Human Control**

Figure 6-1 illustrates Gamepad mappings for controlling humans.

**i**

The Mode button switches the functions of the D-pad and the left thumbstick. Since it is easy to inadvertently press it, if the D-pad and thumbstick are not working as expected, check the Mode button. It should be off (no green light).



Figure 6-1. Human controls

### **6.3. Logitech Gamepad Mappings for Using the Action Menu**

Figure 6-2 illustrates Gamepad mappings for the Action menu.



Figure 6-2. Gamepad menu controls

## 6.4. Logitech Gamepad Mappings for the LAV and M1A2

Gamepad mappings for controlling the LAV and M1A2 depend on the role you are playing. They are illustrated as follows:

- [Figure 6-3](#) illustrates driver controls. These controls also apply to driving the M1A2 Abrams tank, except as noted.
- [Figure 6-4](#) illustrates commander controls.
- [Figure 6-5](#) illustrates gunner controls. These controls also apply to driving the M1A2 Abrams tank.



Figure 6-3. Driver controls for LAV and M1A2



Figure 6-4. LAV commander controls



Figure 6-5. Gunner controls for LAV and M1A2

## 6.5. G27 Racing Wheel Controller

Figure 6-6 illustrates the mappings of the G27 racing wheel for use with VR-Engage.



If your racing wheel is not working as expected, make sure you are using the latest drivers.



Figure 6-6. G27 racing wheel controls

## **6.6. Logitech Gamepad Mappings for Cars and Trucks**

This section describes Gamepad mapping for cars and trucks. These vehicles have a driver role, but for the most part do not have weapons.



Figure 6-7. Driver controls for cars and trucks

## 6.7. Flight Controllers

VR-Engage includes mappings for the Thrustmaster HOTAS Warthog flight (Joystick-HOTAS Warthog) controller, the T.Flight Hotas X (T.Flight Hotas X) flight controller, and the Gamepad F310 and F710 (Logitech Dual Action).

### 6.7.1. Thrustmaster HOTAS Warthog Mappings for Fixed-Wing Entities

[Figure 6-8](#) and [Figure 6-9](#) show the mappings for the Thrustmaster Warthog flight controller for fixed-wing entities.



Figure 6-8. Thrustmaster HOTAS Warthog joystick mappings - fixed-wing

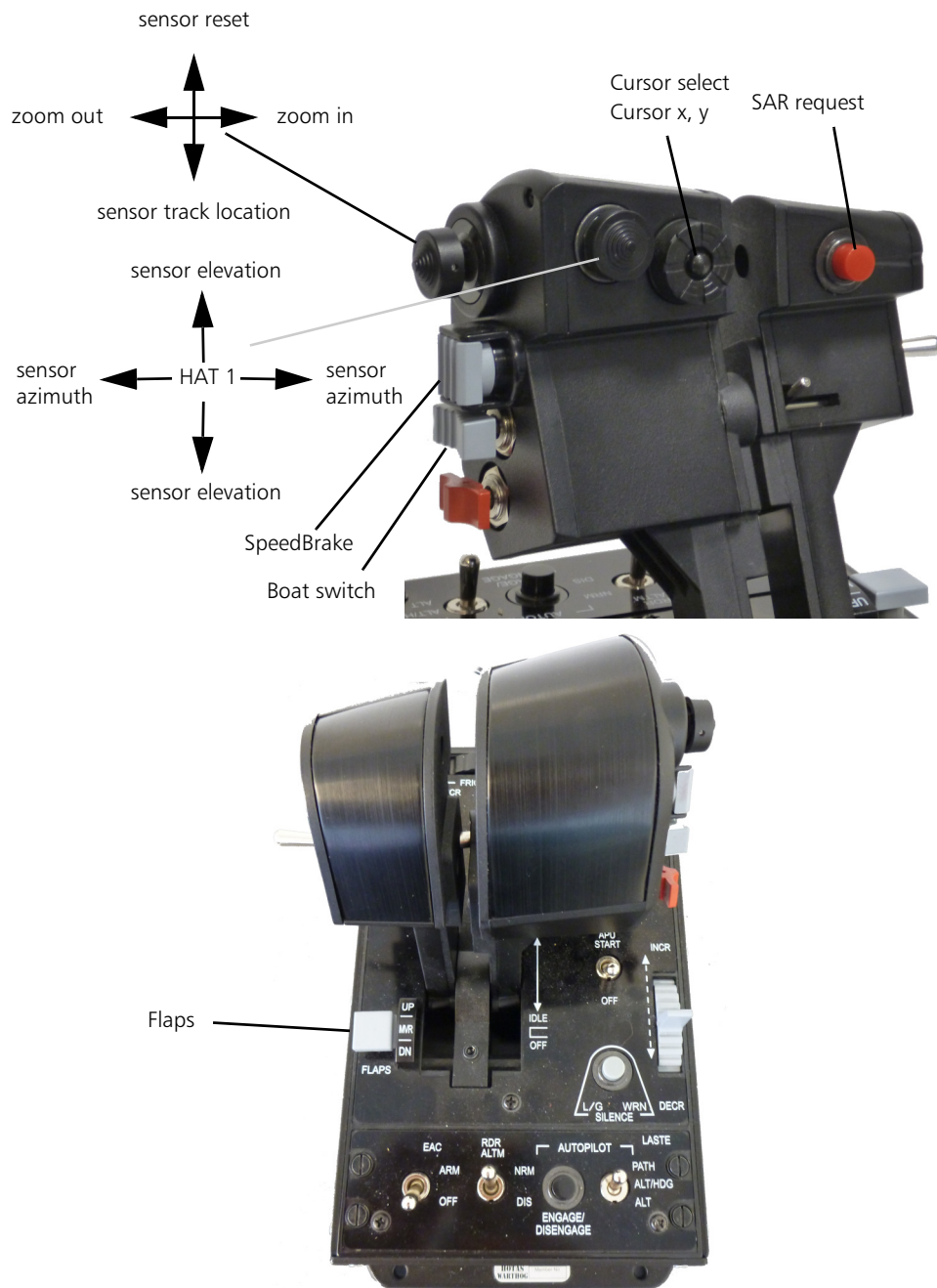


Figure 6-9. Thrustmaster HOTAS Warthog throttle mappings - fixed-wing

[Table 6-3](#) lists the flight controls for the Thrustmaster HOTAS Warthog controller for fixed-wing entities.

Table 6-3: Thrustmaster HOTAS Warthog mappings - fixed-wing

| Function                         | Key/Button                                                                                                                                                           |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extended Flight Controls         |                                                                                                                                                                      |
| Flap 1                           | Throttle Button 22 Down. Toggle states match joystick up, maneuver, down.                                                                                            |
| Flap 2                           | Throttle Button 23 Down. Toggle states match joystick up, maneuver, down.                                                                                            |
| Fire Missile                     |                                                                                                                                                                      |
| fire                             | Button 1                                                                                                                                                             |
| FixedWingLib CGF Flight Controls |                                                                                                                                                                      |
| air-brake                        | Boat Switch (Button 10) Down. This causes excess drag and the plane's speed drops quickly.                                                                           |
| pitch                            | Joystick forward and back (Axis 2)                                                                                                                                   |
| roll                             | Joystick left and right (Axis 1)                                                                                                                                     |
| throttle                         | Throttle lever (Axis 3)                                                                                                                                              |
| wheel-brake                      | SpeedBrake (Button 7) Down, button 8 Down. If you pull back and release, it recenters. If you push forward, it locks in place. Both directions activate full brakes. |
| Gimbaled Sensor                  |                                                                                                                                                                      |
| sensor-azimuth                   | Throttle HAT 1 Right (Up), HAT 1 Left (Down)                                                                                                                         |
| sensor-elevation                 | Throttle HAT 1 Up (Up), HAT 1 Down (Down)                                                                                                                            |
| sensor-reset                     | Throttle Button 3 Down                                                                                                                                               |
| sensor-track-location            | Throttle Button 5 Down                                                                                                                                               |
| sensor-zoom                      | Throttle Button 4 (Down), Button 6 (Up)                                                                                                                              |
| Radar Scope                      |                                                                                                                                                                      |
| cursor-select                    | Button 1                                                                                                                                                             |
| cursor-x                         | Axis 1                                                                                                                                                               |
| cursor-y                         | Axis 2                                                                                                                                                               |
| Release Bomb                     |                                                                                                                                                                      |
| release                          | Button 2                                                                                                                                                             |
| SAR                              |                                                                                                                                                                      |
| request                          | Throttle Button 15                                                                                                                                                   |

## 6.7.2. Thrustmaster HOTAS Warthog Mappings for Rotary-Wing Entities

Figure 6-10 and Figure 6-11 show the mappings for the Thrustmaster Warthog flight controller for rotary-wing entities.

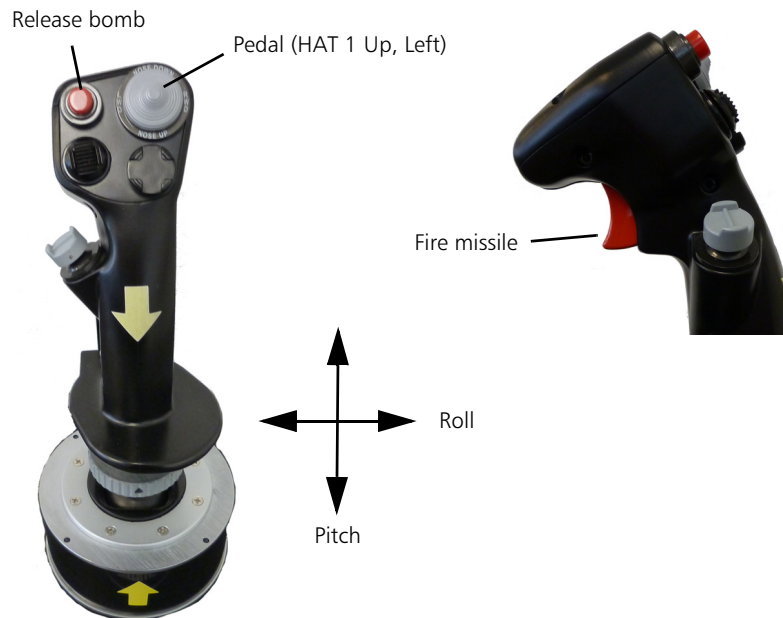


Figure 6-10. Thrustmaster HOTAS Warthog joystick mappings - rotary-wing

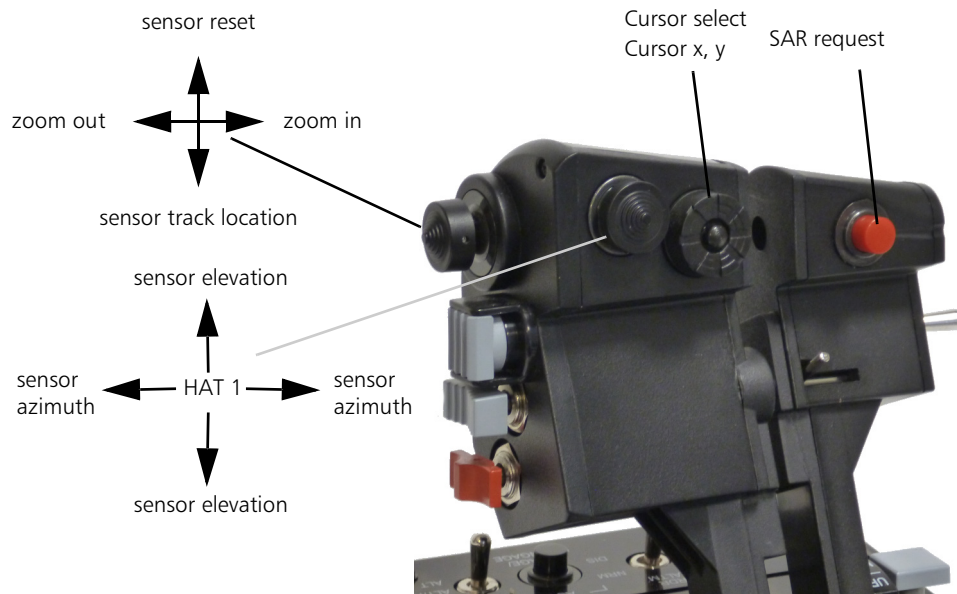


Figure 6-11. Thrustmaster HOTAS Warthog throttle mappings - rotary-wing

[Table 6-4](#) lists the flight controls for the Thrustmaster HOTAS Warthog controller for rotary-wing entities.

Table 6-4: Thrustmaster HOTAS Warthog mappings - rotary-wing

| Function                          | Key/Button                                   |
|-----------------------------------|----------------------------------------------|
| Fire Missile                      |                                              |
| fire                              | Button 1 Down                                |
| Gimbaled Sensor                   |                                              |
| sensor-azimuth                    | Throttle HAT 1 Right (Up), HAT 1 Left (Down) |
| sensor-elevation                  | Throttle HAT 1 Up (Up), HAT 1 Down (Down)    |
| sensor-reset                      | Throttle Button 3 Down                       |
| sensor-track-location             | Throttle Button 5 Down                       |
| sensor-zoom                       | Throttle Button 4 (Down), Button 6 (Up)      |
| Radar Scope                       |                                              |
| cursor-select                     | Button 1                                     |
| cursor-x                          | Axis 1                                       |
| cursor-y                          | Axis 2                                       |
| Release Bomb                      |                                              |
| release                           | Button 2                                     |
| RotorLib CGF Rotary Wing Controls |                                              |
| collective                        | Axis 3, <UP>, <DOWN>                         |
| pedal                             | HAT 1 Up, HAT 1 Left                         |
| pitch                             | Axis 2, W                                    |
| roll                              | Axis 1, D (Up), A (Down)                     |
| wheel-brake                       | B                                            |
| SAR                               |                                              |
| request                           | Button 15                                    |

### 6.7.3. T.Flight Hotas X Mappings for Fixed-Wing Entities

Figure 6-12 shows the joystick controls for the T.Flight Hotas X flight controller for fixed-wing entities.



Figure 6-12. Fixed-wing T.Flight Hotas X joystick - fixed wing

Figure 6-13 shows the throttle controls for the T.Flight Hotas X flight controller for fixed-wing entities.

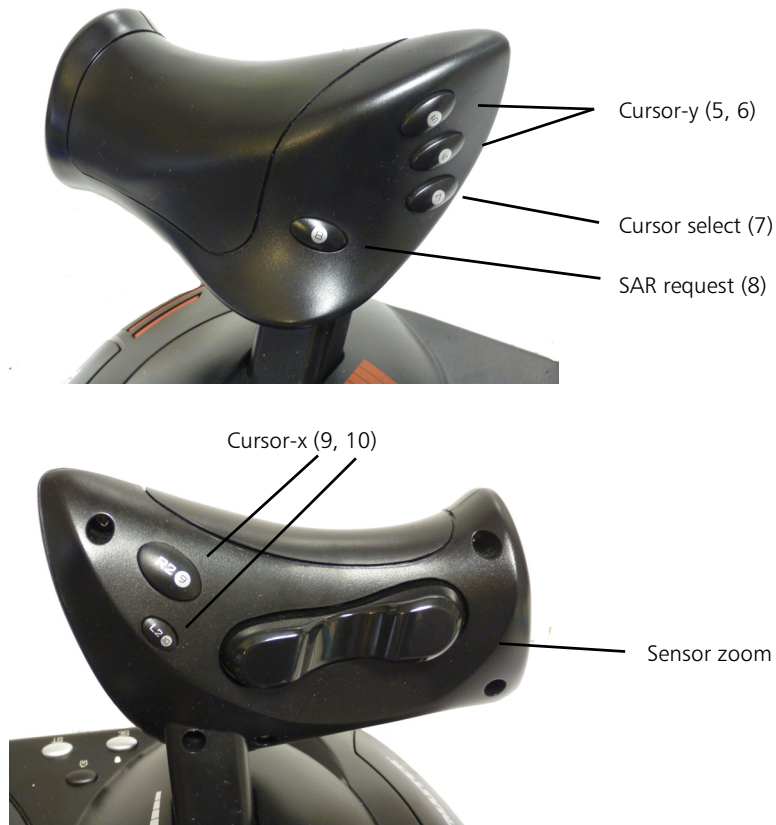


Figure 6-13. Fixed-wing T.Flight Hotas X throttle - fixed-wing

[Table 6-5](#) lists the flight controls for the T.Flight Hotas X controller for fixed-wing entities.

Table 6-5: T.Flight Hotas X mappings - fixed-wing

| Function                         | Key/Button                             |
|----------------------------------|----------------------------------------|
| Fire Missile                     |                                        |
| fire                             | Button 2 Down                          |
| FixedWingLib CGF Flight Controls |                                        |
| pedal                            | Joystick twist left and right (Axis 4) |
| pitch                            | Joystick forward and back (Axis 2)     |
| roll                             | Joystick left and right (Axis 1)       |
| throttle                         | Throttle forward and back (Axis 3)     |
| Gimbaled Sensor                  |                                        |
| sensor-azimuth                   | HAT 1 Right, Left                      |
| sensor-elevation                 | HAT 1 Up, Down                         |

Table 6-5: T.Flight Hotas X mappings - fixed-wing

| Function              | Key/Button                                  |
|-----------------------|---------------------------------------------|
| sensor-reset          | R                                           |
| sensor-track-location | L                                           |
| sensor-zoom           | Rocker buttons on back of throttle (Axis 5) |
| Menu                  |                                             |
| down                  | HAT 1 Down, <DOWN>                          |
| left                  | HAT 1 Left, <LEFT>                          |
| right                 | HAT 1 Right, <RIGHT>                        |
| up                    | HAT 1 Up, <UP>                              |
| Radar Scope           |                                             |
| cursor-select         | Button 7 Down Toggle                        |
| cursor-x              | Button 9 (Up), Button 10 (Down), Axis 5     |
| cursor-y              | Button 5 (Up), Button 6 (Down)              |
| Release Bomb          |                                             |
| release               | Button 1 Down                               |
| SAR                   |                                             |
| request               | S, Button 8 Down                            |

#### 6.7.4. T.Flight Hotas X Mappings for Rotary-Wing Entities

Figure 6-14 shows the joystick controls for the T.Flight Hotas X flight controller for rotary-wing entities.



Figure 6-14. Fixed-wing T.Flight Hotas X joystick - rotary-wing

Figure 6-15 shows the throttle controls for the T.Flight Hotas X flight controller for rotary-wing entities.

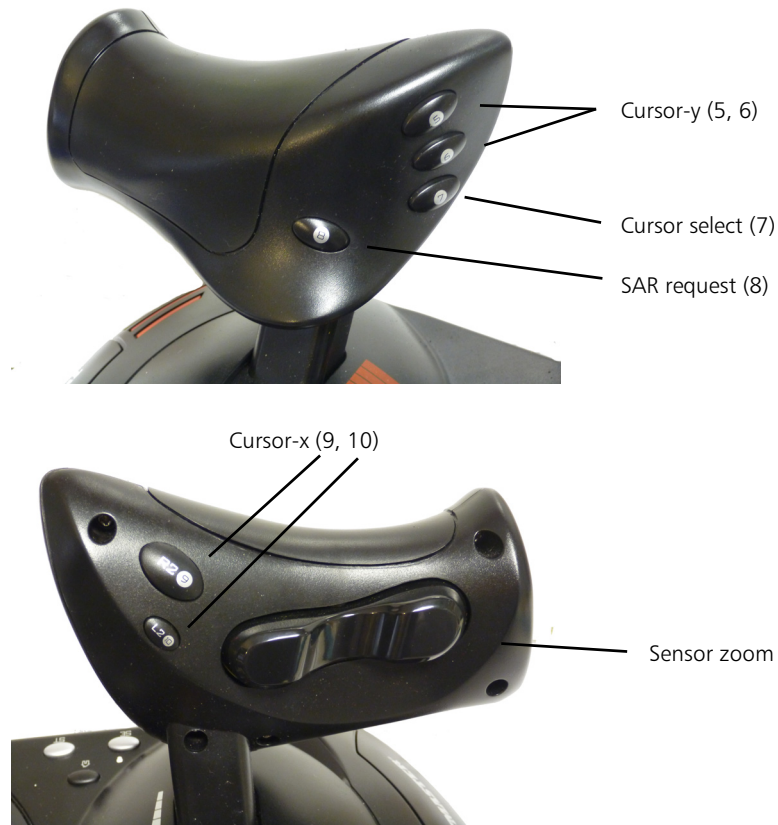


Figure 6-15. Fixed-wing T.Flight Hotas X throttle - rotary-wing

Table 6-6 lists the flight controls for the T.Flight Hotas X controller for rotary-wing entities.

Table 6-6: T.Flight Hotas X mappings - rotary-wing

| Function              | Key/Button                                  |
|-----------------------|---------------------------------------------|
| Fire Missile          |                                             |
| fire                  | Button 2 Down                               |
| Gimbaled Sensor       |                                             |
| sensor-azimuth        | HAT 1 Right, Left                           |
| sensor-elevation      | HAT 1 Up, Down                              |
| sensor-reset          | R                                           |
| sensor-track-location | L                                           |
| sensor-zoom           | Rocker buttons on back of throttle (Axis 5) |
| Menu                  |                                             |
| down                  | HAT 1 Down, <DOWN>                          |

Table 6-6: T.Flight Hotas X mappings - rotary-wing

| Function                          | Key/Button                              |
|-----------------------------------|-----------------------------------------|
| left                              | HAT 1 Left, <LEFT>                      |
| right                             | HAT 1 Right, <RIGHT>                    |
| up                                | HAT 1 Up, <UP>                          |
| Radar Scope                       |                                         |
| cursor-select                     | Button 7                                |
| cursor-x                          | Button 9 (Up), Button 10 (Down), Axis 5 |
| cursor-y                          | Button 5 (Up), Button 6 (Down)          |
| Release Bomb                      |                                         |
| release                           | Button 1                                |
| RotorLib CGF Rotary Wing Controls |                                         |
| collective                        | Throttle forward and back (Axis 3)      |
| pedal                             | Joystick twist left and right (Axis 4)  |
| pitch                             | Joystick forward and back (Axis 2)      |
| roll                              | Joystick left and right (Axis 1)        |
| SAR                               |                                         |
| request                           | S, Button 8                             |

### 6.7.5. Gamepad Flight Control Mappings for Fixed-Wing Entities

Figure 6-16 illustrates the fixed-wing flight controls for Gamepads.



Figure 6-16. Fixed-wing flight controls

Table 6-7 lists the flight controls for Gamepads for fixed-wing entities.

Table 6-7: Gamepad flight control mappings - fixed-wing

| Function                         | Key/Button                              |
|----------------------------------|-----------------------------------------|
| Fire Missile                     |                                         |
| fire missile                     | Button 8 Down Toggle                    |
| FixedWingLib CGF Flight Controls |                                         |
| pedal                            | Axis 1 (Left thumbstick, left/right)    |
| pitch                            | Axis 4 (Right thumbstick, forward/back) |
| roll                             | Axis 3 (Right thumbstick, left/right)   |
| throttle                         | Axis 2 (Left thumbstick, forward/back)  |
| Gimbaled Sensor                  |                                         |
| sensor-azimuth                   | HAT 1 Left (Up), Right (Down)           |
| sensor-elevation                 | HAT 1 Up (Up), Down (Down)              |
| sensor-reset                     | R                                       |
| sensor-track-location            | L                                       |
| sensor-zoom                      | Button 5 (Up), Button 6 (Down)          |
| SAR                              |                                         |
| request                          | S                                       |

## 6.7.6. Gamepad Flight Control Mappings for Rotary-Wing Entities

Figure 6-17 shows the buttons for the F310 Gamepad for rotary-wing control.



Figure 6-17. Gamepad rotary-wing flight controls

Table 6-8 lists the flight controls for Gamepads. for rotary-wing entities

Table 6-8: Gamepad flight control mappings - rotary-wing

| Function                          | Key/Button                     |
|-----------------------------------|--------------------------------|
| Fire Missile                      |                                |
| fire missile                      | Button 8 Down Toggle           |
| Gimbaled Sensor                   |                                |
| sensor-azimuth                    | HAT 1 Left (Up), Right (Down)  |
| sensor-elevation                  | HAT 1 Up (Up), Down (Down)     |
| sensor-reset                      | R                              |
| sensor-track-location             | L                              |
| sensor-zoom                       | Button 5 (Up), Button 6 (Down) |
| RotorLib CGF Rotary Wing Controls |                                |
| collective                        | Axis 2                         |
| pedal                             | Axis 1                         |
| pitch                             | Axis 4                         |

Table 6-8: Gamepad flight control mappings - rotary-wing

| Function | Key/Button |
|----------|------------|
| roll     | Axis 3     |
| SAR      |            |
| request  | S          |

## 6.8. Generic Gamepad Button Numbering

Game controllers are mapped in the Joystick Configuration page of the Application Settings dialog box. (For details, please see [“Configuring Joysticks and Keyboard Control,”](#) on page 6-25.) The mapping are identified by button and axis numbers. [Figure 6-18](#) identifies the button and axis numbering scheme.

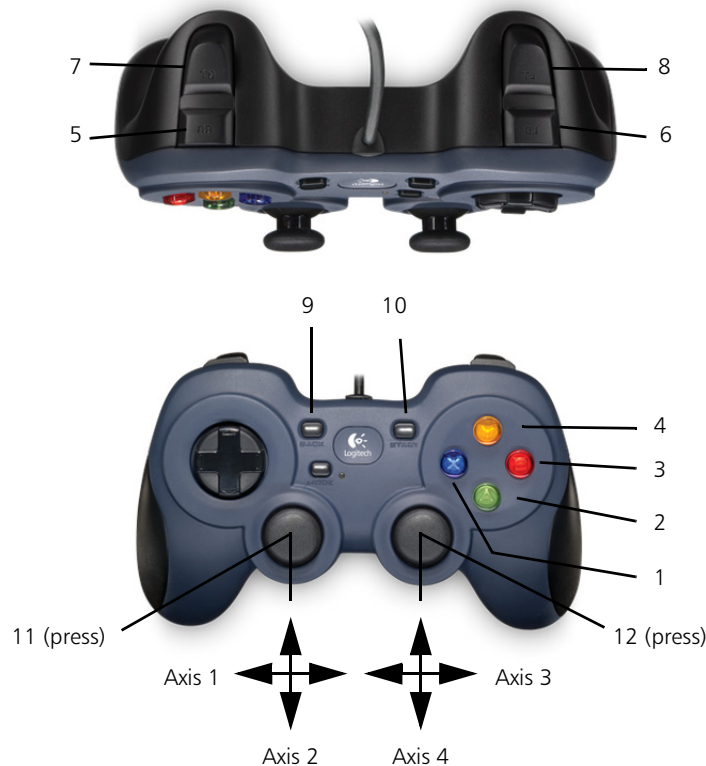


Figure 6-18. Button and axis numbering

## 6.9. Configuring Joysticks and Keyboard Control

You can control entity movement and weapon fire using a joystick, the keyboard, or both. You can attach multiple joysticks and can use a mix of joystick and keyboard control at the same time. You configure joystick and keyboard mappings on the Application Settings dialog box, Joystick Configuration page. You must add a new configuration for each controller that you want to use.

### 6.9.1. Creating a Joystick Configuration

A joystick configuration contains the joystick mappings and, optionally, keyboard mappings that you can use to control an entity. VR-Engage includes default configurations for several game controllers.

**To create a joystick configuration:**

1. Create or open a scenario.
2. Choose **Settings** → **Application**. The Application Settings dialog box opens.
3. Select the Joystick Configuration page (Figure 6-19).

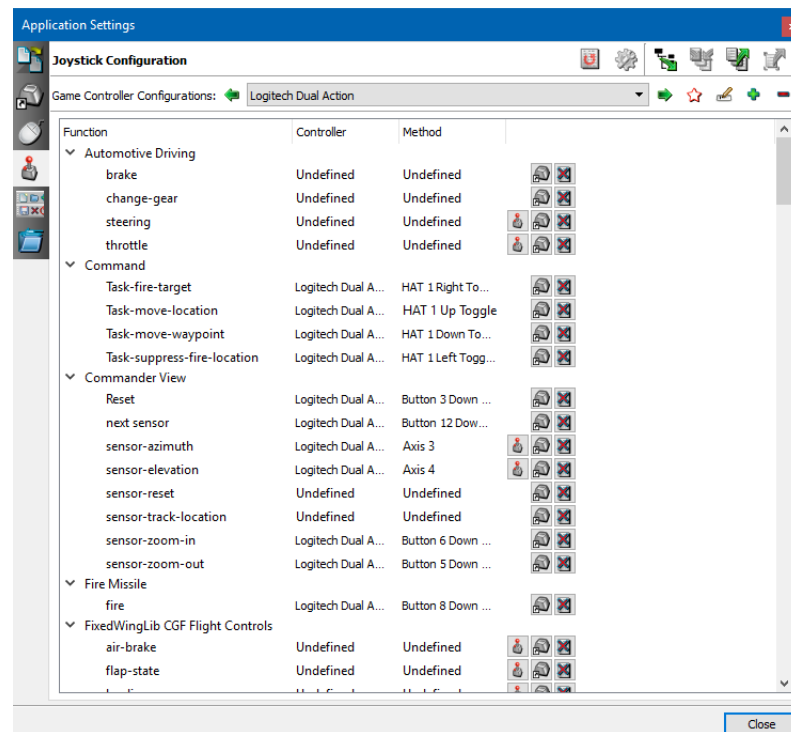


Figure 6-19. Joystick Configuration page

4. Click the Add button (+). The New Configuration dialog box opens.
5. Type a name for the configuration.



The name you give the configuration must match the name that the controller identifies itself as when it connects to the computer.

6. Click OK. The window redisplay to show the functions that this device can control (Figure 6-20).

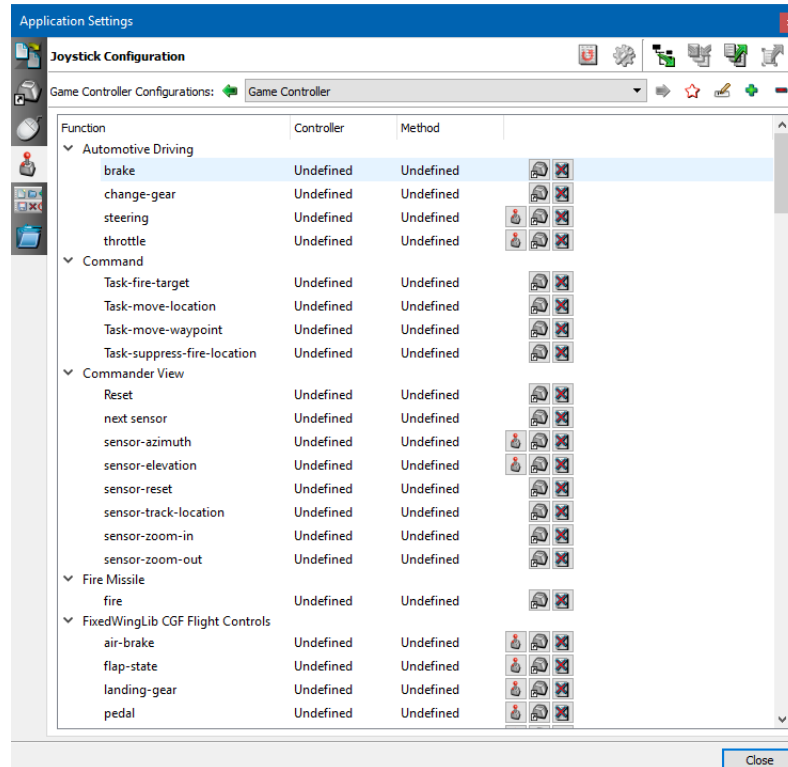


Figure 6-20. Joystick configuration

7. Edit the joystick and keyboard mappings as described in “[Mapping the Joystick Stick](#),” on page 6-27 and “[Mapping Joystick Buttons and Keyboard Keys](#),” on page 6-28.

## 6.9.2. Mapping the Joystick Stick

To control an entity with a joystick, you map the joystick controls to specific entity movement components and weapons.

### To map joystick controls:

1. Create a joystick configuration, as described in “[Creating a Joystick Configuration](#),” on page 6-25.
2. On the Joystick Configuration page ([Figure 6-20](#)), click the Joystick button () for the function you want to map. A joystick configuration dialog box opens ([Figure 6-21](#)).

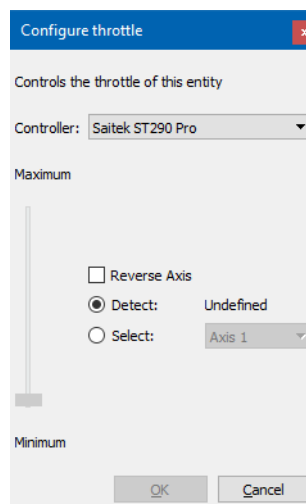


Figure 6-21. Joystick configuration dialog box

3. In the Controller list, select the controller you want to configure.
4. Configure each axis as follows:
  - a. To let VR-Engage select the axis, select the Detect option and move the joystick in the axis you want to use for this control.
  - b. To choose the axis, select the Select option and select an Axis from the list.
  - c. Move the joystick in the axis you are configuring. If the Maximum/Minimum slider moves in the direction that you expect, you are finished. If the slider moves opposite to what you expect, select the Reverse Axis check box. It should now move as expected.
5. Click OK.
6. Repeat this process for each function you want to control with the joystick.

### 6.9.3. Mapping Joystick Buttons and Keyboard Keys

You can map joystick buttons and keyboard keys to entity movement control and weapon control. When entity control is enabled, the entity control key mappings override any other key mappings, such as observer control mappings.

**To map joystick buttons and keyboard keys to entity control:**

1. Create a joystick configuration, as described in “[Creating a Joystick Configuration](#),” on page 6-25.
2. On the Joystick Configuration page ([Figure 6-19](#)), click the Key Mapping button () for the control you want to map. A configuration dialog box opens. It may call for a range of values ([Figure 6-22](#)), or just be a toggle ([Figure 6-23](#)).

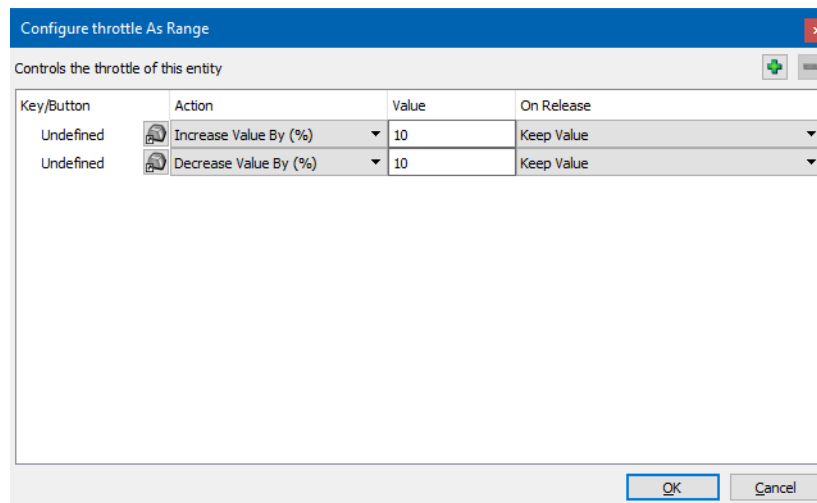


Figure 6-22. Key mapping configuration dialog box

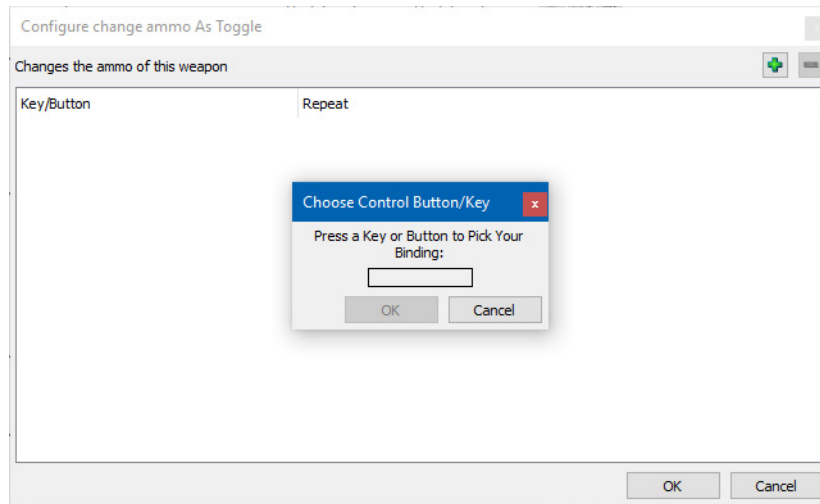
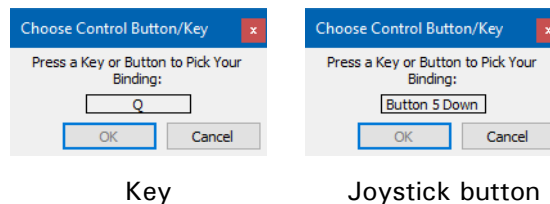


Figure 6-23. Key mapping configuration as toggle dialog box

3. If the mapping requires a range, for each row in the dialog box, do the following:
  - a. Click the Key Mapping button (🖱️). The Choose Control Button/Key dialog box opens (Figure 6-23).
  - b. Press the joystick button or keyboard key that you want to use to activate this control. It is displayed in the dialog box (Figure 6-24). (If a key binding is not available, the OK button does not become activated.)



Key

Joystick button

Figure 6-24. Choose Control Button/Key dialog box with selection

- c. Click OK.
- d. In the Action column, select an option from the list.
- e. In the Value column, enter an appropriate value for the Action option.
- f. In the On Release column, select an option from the list. (This is what happens when you release the key.) A complete dialog box looks similar to Figure 6-25.

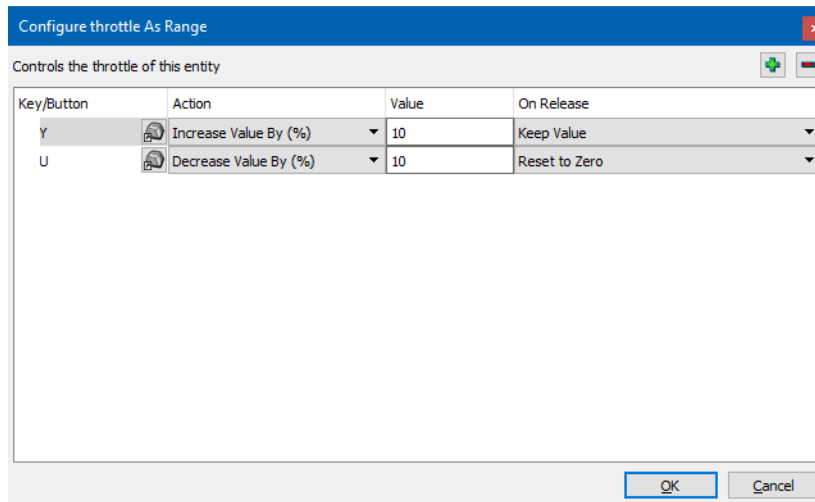


Figure 6-25. Key mapping configuration dialog box

4. If the keyboard mapping is a toggle, The Choose Control Button/Key dialog box opens automatically. Do the following:
  - a. Press the key or joystick button that you want to use.
  - b. Click OK.
  - c. In the Repeat column, select Yes or No. Yes means that the action repeats if you hold down the key. No means it happens one time for each key press.
5. Click OK.
6. Repeat this process for each function you want to configure.

### 6.9.4. Configuring “Switch Between” Options

Some entities may have multiple systems of a certain type, such as weapons. You might want to be able to control all similar systems with the same set of keys and joystick controls. VR-Engage lets you do this with switch groups. You can specify a key or button to press to switch between the different systems in a switch group. For example, you might press a button to switch between a tank’s main battle gun and a machine gun.

The controls for which you can specify a switch between option are listed in the Switch Between section of the Joystick Configuration page (Figure 6-26). Specifying the key or button to use is described in “Mapping Joystick Buttons and Keyboard Keys,” on page 6-28.

| Switch Between                   |           |           |                                                                                                                                                                             |
|----------------------------------|-----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| weapon                           | Undefined | Undefined |       |
| weapon:120mm Ballistic Gun       |           |           |                                                                                                                                                                             |
| change ammo                      | Undefined | Undefined |       |
| elevation                        | Undefined | Undefined |       |
| fire                             | Undefined | Undefined |       |
| slew                             | Undefined | Undefined |       |
| weapon:M2 Ballistic Gun          |           |           |                                                                                                                                                                             |
| change ammo                      | Undefined | Undefined |       |
| elevation                        | Undefined | Undefined |       |
| fire                             | Undefined | Undefined |     |
| slew                             | Undefined | Undefined |   |
| weapon:M240-7-62mm Ballistic Gun |           |           |                                                                                                                                                                             |
| change ammo                      | Undefined | Undefined |   |
| elevation                        | Undefined | Undefined |   |
| fire                             | Undefined | Undefined |   |
| slew                             | Undefined | Undefined |   |

Figure 6-26. Switch between option





## 7. Using Blueberry3D Terrains

VR-Engage supports procedural terrains from Blueberry 3D.

|                                                              |     |
|--------------------------------------------------------------|-----|
| <a href="#">Introduction</a> .....                           | 7-2 |
| <a href="#">Setting Blueberry3D Runtime Parameters</a> ..... | 7-2 |
| <a href="#">Setting the Blueberry3D Camera</a> .....         | 7-3 |

## 7.1. Introduction

Blueberry3D terrains provide highly realistic vegetation and landscape that is procedurally generated, rather than hand-modeled. The VR-Engage demo terrains data package includes the Baqa terrain, which is a Blueberry3D terrain.

If you load a Blueberry3D terrain, the Blueberry3D menu in the VR-Engage window becomes available. It has options for setting Blueberry3D parameters and the Blueberry3D camera.

### 7.1.1. Setting Blueberry3D Runtime Parameters

The Blueberry3D Runtime parameters dialog box, (Figure 7-1), lets you set a variety of parameters. When you select a parameter, a description of the parameter is displayed. For complete information about Blueberry3D parameters, please see Blueberry3D documentation.

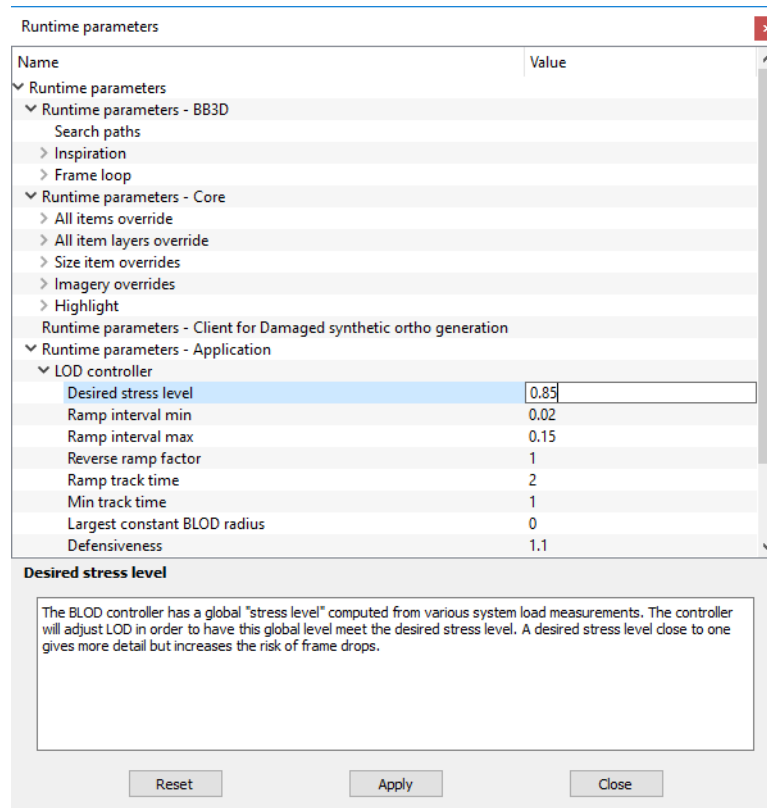


Figure 7-1. Blueberry3D runtime parameters

**To set Blueberry3D parameters:**

1. Choose **Blueberry3D** → **Runtime parameters**. The Runtime parameters dialog box opens.
2. Expand the hierarchy for the parameter you want to edit.
3. Change the value.
4. Click Apply or Close.

**7.1.2. Setting the Blueberry3D Camera**

The Blueberry3D camera opens up in a default location on the terrain. You can change the camera using the Camera Properties dialog box. The position settings apply to 2D and 3D views. The orientation settings only apply if you are using the 3D view. You can save camera settings and reload them. This setting has no effect on the location of the eyepoint once you select a character and join the simulation.

**To set the Blueberry3D camera:**

1. Choose **Blueberry3D** → **Camera properties**. The Camera dialog box opens ([Figure 7-2](#)).

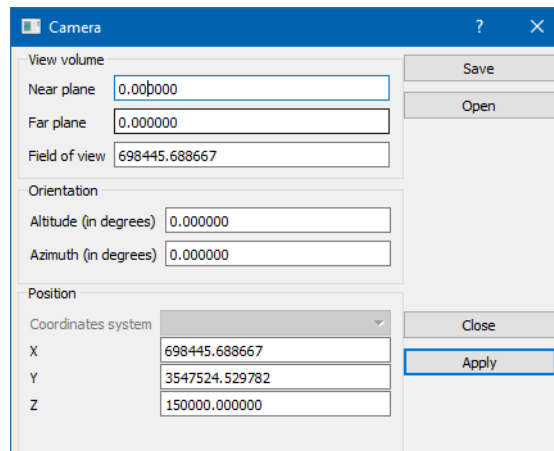


Figure 7-2. Camera dialog box

2. Change any of the values as desired.
3. Click Apply or Close. If the change you made affects the view you are using, the camera moves to the new location.





## 8. Activating Scripts in VR-Forces

Characters in VR-Engage can activate scripts in the VR-Forces simulation engine.

|                                                           |     |
|-----------------------------------------------------------|-----|
| <a href="#">Activating Lua Scripts in VR-Forces</a> ..... | 8-2 |
| <a href="#">Adding a Script to the Action Menu</a> .....  | 8-2 |
| <a href="#">Activating a Script</a> .....                 | 8-3 |

## 8.1. Activating Lua Scripts in VR-Forces

VR-Forces lets customer add tasks and set data requests by writing Lua scripts. Lua is a scripting language that does not require compilers and software development tools like those required by the VR-Forces C++ toolkit. Also, you do not need a VR-Forces developers license to add Lua scripts.

VR-Engage characters can trigger scripts or activate them in the VR-Forces simulation engine. Once a script is triggered, there is no further involvement of the character you are playing. The script must have previously been written in VR-Forces. Then it must be added to the Action menu to be accessible to characters.

For information about how to write a script, please see *VR-Forces Users Guide*. This chapter explains how to add a script to the Action menu and how to execute it.

## 8.2. Adding a Script to the Action Menu

The Action menu for human characters is configured in the file `.\appData\scripts\playerDefinitions\human.lua`.

The Action menu and the Scripts submenu are configured in the following lines of the file (comments have been removed):

```
updaters={
  DtActionMenuUpdater = {
    menus={
      ["Action"] = {
        parent="";
        size={x = 400, y = 300};
        position={ x= 100, y = 300};
        elements={
          {label = "Flashlight:", action = "toggleFlashlight",
            decorator="$STATE", stateAttribute="flashlight",
            stateList={"OFF", "ON"} };
          {label = "Night Vision:", action = "toggleNvg",
            decorator="$STATE", stateAttribute="NVG", stateList={"OFF",
            "ON"} };
          {label = "Radio", action = "cycleRadio", decorator="$STATE",
            stateAttribute="currentRadio"};
          {label = "Task entity", action = "selectMenu",
            param = "Select Entity"};
          {label = "Execute Script", action = "selectMenu",
            param = "Scripts"};
          ...
        };
      };
      ...
      ["Scripts"] ={
        parent="Action";
        elements={
          {label = "Script 1", action="scriptedTask",
            param="Fire_For_Effect_on_Location",
            cursor="selectLocationCursor"};
          ...
        };
      };
    };
  };
}
```



---

The `label = "Execute Script"` line might be commented out. You need to uncomment it for the Execute Script menu command to be enabled.

---

The Scripts menu option is added as an element of the Action menu. It has an element for each script to be listed on the submenu. In this case, there is one script, with the following parameters:

- ♦ `label`. The text shown on the menu.
- ♦ `action`. Must be `scriptedTask`.
- ♦ `param`. The name of the lua script.
- ♦ `cursor`. A location selected by the player. This is the only input to the script.

The only input that a VR-Engage character can provide to a script is a cursor position.

### ***8.3. Activating a Script***

You can tell VR-Forces to activate a script.

**To activate a script:**

1. Press `~` or the Action menu button on your game controller. The Action menu opens.
2. Use the up and down arrow keys or the game controller to select Execute Script.
3. Press the right arrow key, or the right button on the D-pad to show the submenu. The Scripts menu opens.
4. Select the script that you want to activate.
5. Press the right arrow key or right button on the D-pad.





# Index

## A

- Abrams tank, driving 4-12, 4-13
- Action menu 4-3
  - Gamepad mapping 6-5
  - mouse and keyboard mappings 6-3
  - opening 4-3
- adding, aircraft entities 5-16
- aircraft
  - configured 5-2
  - configuring 5-16
  - controlling 5-6
- air-to-air combat 5-8
- area of interest, specifying 5-13
- assigning task 4-6
- attach** parameter 3-12

## B

- binoculars 4-11
- Blueberry3D
  - camera 7-3
  - parameters 7-2
- Blueberry3D terrain 7-2
- bombing, target 5-7
- brake
  - parking, releasing and engaging 4-14
- braking, ground vehicle 4-14
- button
  - Joystick 6-27
  - Key Mapping 6-28

## C

- camera, Blueberry3D 7-3
- car
  - driving 4-15
  - Gamepad mapping 6-9
- Change Role Panel 3-8
- changing, role 3-8
- choosing
  - role 3-5
  - weapon 4-4
- combat, air-to-air 5-8
- commander, LAV 4-13
- configuration
  - file, RTI 2-8
- configuration file, pilot.lua 5-6
- configuring
  - aircraft 5-16
  - image properties 5-15
  - joystick 6-25
  - keyboard entity control 6-25
  - SAR request 5-11
  - system for MÅK RTI 2-8
- controller, flight 6-10
- controlling
  - aircraft 5-6
  - VR-Forces entity 3-8
- conventions, manual xii
- coordinateConverterOrigin** parameter 4-19
- creating, joystick configuration 6-25

## D

- dialog box
  - License Setup 2-6

- dialog box (continued)
  - SAR Request Settings 5-11, 5-13, 5-14
  - Simulation Connections 3-10
- differential, locking and unlocking 4-14
- disabling, mouse control 6-3
- disabling instancing 4-18
- Disembark Entity task 4-7
- disembarking, vehicle 4-5
- display, aircraft 5-6
- door, opening and closing 4-12
- driver, LAV 4-13
- driving
  - cars and trucks 4-15
  - M1A2 4-12, 4-13

## **E**

- embarking
  - on vehicle 3-9
  - vehicle 4-5
- enabling, mouse control 6-3
- engaging LAV gear 4-14
- entity
  - task, assigning 4-6
  - VR-Forces, controlling 3-8
- entity parameter 3-12
- environment variable
  - MAKLMGRD\_LICENSE\_FILE 2-7
  - RTI\_CONFIG 2-8
- event, scenario 4-17
- exampleStartupConfig.lua 3-12
- executing
  - script
    - activating, script 8-3

## **F**

- FDD file 2-8
- FED file 2-8
- file
  - FED 2-8
  - RID 2-8
- firing
  - missile 5-8
  - weapon 4-4
- first person view mode 4-16
- flashlight, using 4-10
- FLEXIm 2-4, 2-5
- flight controller 6-10
- Follow Me task 4-7

- FOM 2-8
- fullscreen mode 3-13

## **G**

- G27 racing wheel, LAV controls 6-8
- Gamepad
  - fixed-wing flight control 6-21
  - generic mappings 6-24
  - mapping
    - Action menu 6-5
    - cars and trucks 6-9
    - human 6-4
    - vehicle 6-6
  - rotary-wing flight control 6-23
- gear
  - LAV, engaging 4-14
- geocentric terrain, configuring Vortex origin 4-19
- ground vehicle
  - braking 4-14
  - resetting 4-16
  - throttle 4-14
- guiTerrain parameter 3-12
- gunner, role 4-13

## **H**

- headlights, turning on and off 4-15
- head-up display 5-3
  - display options 5-6
- hosting, VR-Forces session 3-2
- hostname, license server 2-6
- HOTAS Warthog 6-10
- HUD 5-3
- human
  - Gamepad mapping 6-4
  - mouse and keyboard mappings 6-2
  - resetting 4-16

## **I**

- image
  - properties, configuring 5-15
- infrared sensor 4-11
- installing
  - RTI 2-8
  - VR-Engage 2-2
  - VR-Forces plug-in 2-3
- instancing, disabling 4-18

instrument panel 5-3  
     display options 5-6  
 intercom 4-10  
     using 4-13  
 IR 4-11

## J

joining, VR-Forces session 3-8  
 joystick  
     configuration, creating 6-25  
     configuring 6-25  
     control, mapping 6-27  
     switch between option 6-31  
 Joystick button 6-27  
 Joystick Configuration page 6-25, 6-27, 6-28

## K

Key Mapping button 6-28  
 keyboard  
     control, mapping 6-28  
     entity control, configuring 6-25  
     mapping, Action menu 6-3  
     mappings 6-2

## L

laser code, targeting bomb with 5-7  
 lasing, target 4-11  
 LAV  
     engine, starting 4-14  
     G27 racing wheel controls 6-8  
     gear, engaging 4-14  
     operating 4-12  
     roles on 3-9  
 LAV commander 4-13  
 LAV driver 4-13  
 LAV driving 4-13  
 License Manager 2-4, 2-5  
 license server, hostname 2-6  
 License Setup dialog box 2-6  
 locking, differential 4-14

## M

M1A2  
     driving 4-12, 4-13  
 MÄK RTI, configuring 2-8

MAKLMGRD\_LICENSE\_FILE, environment  
     variable 2-7  
 manual, conventions xii  
 mapping  
     Gamepad  
         Action menu 6-5  
         human 6-4  
         vehicle 6-6  
     joystick controls 6-27  
     joystick keyboard controls 6-28  
     keyboard 6-2  
     mouse 6-2  
 menu, Action 4-3  
 MFD 5-5  
 missile, firing 5-8  
 mode  
     fullscreen 3-13  
     view, view mode 4-16  
     windowed 3-13  
 mode parameter 3-12  
 monitor, display options for aircraft 5-6  
 mouse  
     mappings 6-2  
         Action menu 6-3  
 mouse control, enabling and disabling 6-3  
 Move to Location task 4-8  
 Move to My Location task 4-8  
 moving, terrain on 4-3  
 multi-function display 5-3, 5-5

## N

night vision goggles 4-11  
 NVG 4-11

## O

Oculus Rift 4-18  
 opening  
     Action menu 4-3  
     doors and windows 4-12  
 operating, LAV 4-12

## P

page, Joystick Configuration 6-25, 6-27, 6-28  
 panel, instrument 5-3  
 parachuting 4-6

- parameter
  - attach** 3-12
  - Blueberry3D 7-2
  - coordinateConverterOrigin** 4-19
  - entity** 3-12
  - guiTerrain** 3-12
  - mode** 3-12
  - scenario** 3-12
  - terrain** 3-12
- paratrooper 4-6
- parking brake, releasing and engaging 4-14
- pilot.lua 5-6
- pivoting, tank 4-15
- plug-in, installing VR-Forces and VR-Vantage 2-3
- power, specifying 5-14
- product
  - technical support xi
  - upgrades xi
- properties, image 5-15

## R

- radar, synthetic aperture 5-10
- Radar Indicator 5-8
- RadarFX Server 5-10
- radio, using 4-10
- requesting, SAR image 5-11
- resetting, humans and ground vehicles 4-16
- restoring, humans and ground vehicles 4-16
- RID file 2-8
- rid.mtl* file 2-8
- role
  - changing 3-8
    - by embarking 3-9
  - choosing 3-5
  - gunner 4-13
  - on LAV 3-9
- RTI 2-8
  - definition of 2-8
- RTI\_CONFIG environment variable 2-8

## S

- SAR 5-10
- SAR image, requesting 5-11
- SAR request, configuring 5-11
- SAR Request Settings dialog box 5-11, 5-13, 5-14
- scenario event 4-17
- scenario** parameter 3-12

- script
  - activating 8-3
  - startup 3-12
- sensor
  - infrared 4-11
  - location, specifying 5-11
  - night vision 4-11
- sensor mode
  - changing, crew member 4-11
- session
  - hosting VR-Forces 3-2
  - starting 3-10
  - unhosted 3-4
  - VR-Forces, joining 3-8
- Simulation Connections dialog box 3-10
- simulation network, connecting to 3-10
- specifying
  - area of interest 5-13
  - power 5-14
  - sensor location 5-11
- starting
  - LAV engine 4-14
  - session 3-10
  - VR-Engage 3-2
- startup, script 3-12
- support, technical xi
- Suppress Location task 4-9
- Switch Between option for joystick 6-31
- synthetic aperture radar 5-10

## T

- tank
  - driving 4-12, 4-13
  - pivoting 4-15
- target
  - bombing 5-7
  - lasing 4-11
- targeting
  - bomb, with laser code 5-7
- task
  - assigning to entity 4-6
  - Disembark Entity 4-7
  - Follow Me 4-7
  - Move to Location 4-8
  - Move to My Location 4-8
  - Suppress Location 4-9
- technical support xi
- terrain
  - Blueberry3D 7-2

- terrain (continued)
  - moving on 4-3
- terrain** parameter 3-12
- T.Flight Hotas X 6-10
  - fixed-wing mappings 6-15
  - rotary-wing mappings 6-18
- third person view mode 4-16
- throttle, ground vehicle 4-14
- Thrustmaster Warthog
  - fixed-wing mappings 6-10
  - roastry-wing mappings 6-13
- triggering, script 8-3
- truck
  - driving 4-15
  - Gamepad mapping 6-9

## U

- unhosted session 3-4
- unlocking, differential 4-14
- upgrades xi
- using
  - flashlight 4-10
  - intercom 4-13
  - radio 4-10

## V

- vehicle
  - disembarking from 4-5
  - embarking on 3-9, 4-5
  - Gamepad mapping 6-6
  - intercom 4-13
- visual sensor, vehicle crew 4-11
- Vortex
  - configuring, for geocentric terrain 4-19
  - Gamepad mapping 6-9
- vortexTerrainConfig.lua 4-19
- VR-Engage, starting 3-2
- VR-Engage Air 5-2
- VR-Forces
  - entity, controlling 3-8
  - session, hosting 3-2
- VR-Forces plug-in, installing 2-3

## W

- weapon
  - choosing 4-4

- weapon (continued)
  - firing 4-4
- window, opening and closing 4-12
- windowed mode 3-13
- Windows, installing on 2-2

## X-Y-Z

- XML, RTI configuration file 2-8
- zooming in and out 4-11







Link - Simulate - Visualize

VRN-1.1-1-170809