MAK TECHNOLOGIES

VR-Engage First Experience Guide



Version 2.0

ST Engineering North America

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1. Introduction to VR-Engage

Thank you for deciding to try out VR-Engage. VR-Engage is a multi-role virtual simulator developed for use in training simulations or laboratory experimentation. VR-Engage lets users play the role of a first person human character, a ground vehicle driver, gunner or commander, or the pilot or sensor operator of a fixed wing aircraft or helicopter.

VR-Engage is built with the game quality 3D graphics of VR-Vantage, the simulation engine from VR-Forces, and the network interoperability of VR-Link. VR-Engage is a standalone application. It can interoperate with any simulation using DIS or HLA. However, when installed with a compatible version of VR-Forces, you can reap the benefits of their common system architecture, including scenario creation, terrain agility, common terrains, models, configurations, and common representation of the environment.

Before you begin, install and license the software. See "5.1. Installing VR-Engage" on page 58 for instructions. If you want to control ground vehicles or aircraft, you must connect a game controller. The controllers that VR-Engage supports out of the box are listed in the "Input Devices" topic in the *VR-Engage Users Guide*. Contact support (https://jira.mak.com/servicedesk/customer/portal/1) for help configuring other devices.

This First Experience guide is designed to give you a successful first experience with VR-Engage. It guides you through a series of activities that demonstrate many of the features of the application without bogging you down in the minutiae of all of its capabilities.

VR-Engage includes the following example scenarios:

- VR-Engage Test Drive. VR-Engage Test Drive is a simple scenario that lets you practice controlling the four basic types of players in VR-Engage – humans, ground vehicles, helicopters, and airplanes. Humans and ground vehicles are pretty easy to control, but aircraft can be a bit tricky if you have not played with a flight simulator before.

Once you feel confident controlling the different player types, or if you already feel confident and want to skip the test drive, you can move on to VR-Engage First Experience, which introduces you to the most frequently used VR-Engage capabilities.

- VR-Engage First Experience. A scenario with many different entities that shows off the capabilities of VR-Engage, such as firing weapons, embarking on and disembarking from entities, parachuting, and air-to-air combat.
- VR-Engage Security Checkpoint. An example of how you can customize VR-Engage with new entity types to create a focused training environment.
- MAK Suite Demo. This is a complex scenario that MAK uses to demonstrate the features of VR-Engage and how MAK products work together to create compelling simulations for training.
- MR VR Flight Demo. This scenario has several T-38 C Talon aircraft flying in formation. It is used to demonstrate the mixed reality capability of VR-Engage.



The tutorials in this manual require you to run VR-Forces scenarios. You must have a VR-Forces simulation engine license to run the scenarios. The VR-Engage product does not include a VR-Forces license.

If you do not have a VR-Forces license, you can run VR-Engage, choose a terrain database to simulate an unhosted session, 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 roles and create a different entity to simulate, the entity you were previously simulating is deleted and replaced by the new one.

For details about license issues, see "License Requirements for Hosting a VR-Forces Session" in the *VR-Engage Users Guide*.

For detailed information about using VR-Engage, see the *VR-Engage Users Guide*. The VR-Engage documentation set is provided to all customers in PDF format. PDF versions of the manuals are in the *./doc* directory and, in Windows, are accessible from the MAK Technologies shortcut on the Start menu. You can access a guide to the keyboard and game controller mappings by pressing **F1** or using the **?** button in VR-Engage. There is also HTML help accessible by pressing **Shift + F1**.



2. Controlling Entities in VR-Engage

This first experience assumes that you have some familiarity with using a keyboard and mouse, game controller, or joystick to control vehicles and people in a first-person simulation. If you have not used a game controller before, especially for controlling aircraft, do some extra exploring with the experiences in this chapter to get the feel for them.

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2.1. Start VR-Engage and Load a Scenario

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 asks you what to do.

1. On the Start menu, choose **MAK Technologies > VR-Engage**.

   The VR-Engage window opens, displaying the Choose Connection screen (Figure 1 below).

Figure 1. Choose Connection



2. For this tutorial, select DIS (7) localhost and then click Connect. The Choose Session screen displays (Figure 2).

Figure 2. Choose Session



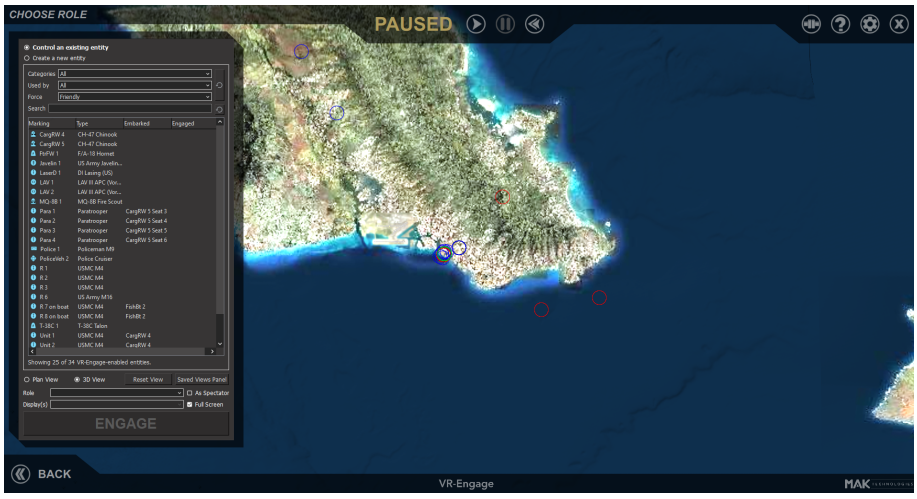
3. Click Host Session. This option lets you load a scenario that was created using VR-Forces and is provided with VR-Engage. The Choose Scenario screen displays (Figure 3).

Figure 3. Choose Scenario



4. Select the VR-Engage First Experience scenario.
5. Click Load Scenario. A loading screen displays while the scenario loads. Once the terrain and scenario load, the Choose Role Panel displays (Figure 4). It lists the characters that are in the scenario for the selected force.

Figure 4. Choose Role panel



2.2. Explore as a Human Character

➤ **To control a human:**

1. In the Choose Role Panel, select the Control an Existing Entity option.
2. In the list of entities, select R1 USMC M4.
3. Click Engage. The display changes to full screen mode and the scenario starts running because you are hosting the session.

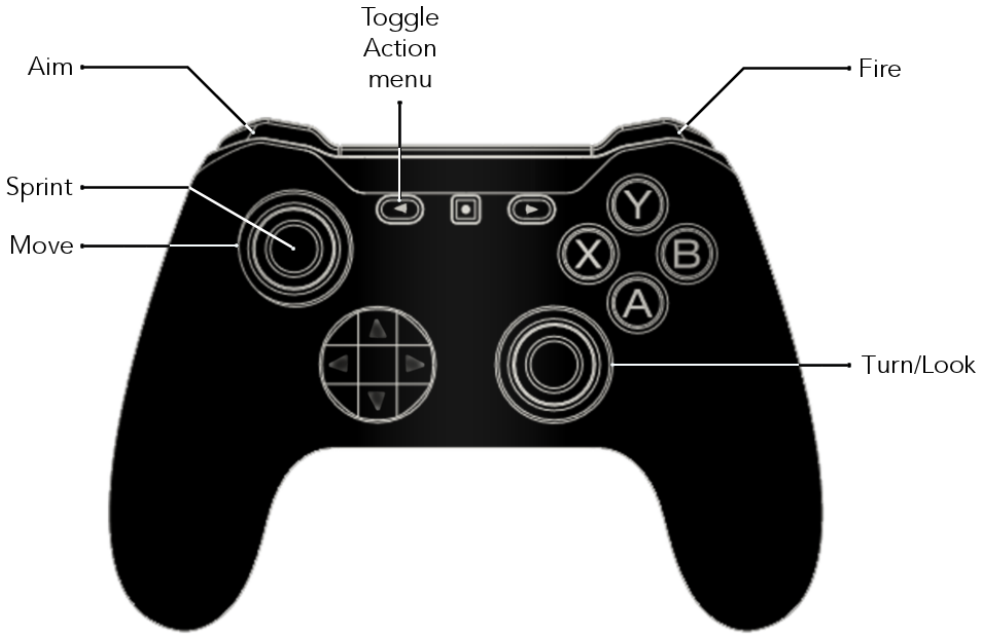
Figure 5 shows R1's view when you first engage it

Figure 5. R1 USMC 1st person view



Refer to Figure 6 for the Xbox controller movement controls for humans, or Figure 7 on the facing page for the keyboard movement controls. The Logitech Gamepad is very similar to the Xbox controller.

Figure 6. Basic human controls



For a complete list of control mappings, press **F1**. You can also refer to Table 3 on page 37 for a complete list of mouse and keyboard mappings and "4.3. Game Controller Mappings for Human Control" on page 41 for all controller mappings.)

2.2.1 Walking Around

Your character is standing in front of a warehouse with other friendly forces and some vehicles.

Walking around requires coordination of the thumbsticks on a game controller, or movement keys on the keyboard.

To walk, push the left thumbstick in the direction that you want to go, or press the **W** (forward), **A** (left), **S** (backward), and **D** (right) keys. When you walk to the left or right, the character continues to face forward.

Figure 7. Primary movement keys, observer coordinates (3D)



To turn (change orientation), push the right thumbstick to the left or right, or press the **H** and **K** keys, or move the mouse left or right. Pushing the right thumbstick forward or back, pressing the **U** and **J** keys, or moving the mouse forward or back causes the character to look up or down.

➤ **To explore the area:**

1. Use the keyboard and mouse, or controller (if you have one), to look around and then start walking.
2. There is a door to the right of the open bays in the warehouse (Figure 8).

Figure 8. Warehouse door



As you get close to the door, the Door menu opens (Figure 9).



You can choose menu options using your keyboard, mouse, and game controller. Rather than trying to list all the options each time we ask you to choose a menu command, we will introduce different methods throughout this chapter.

Figure 9. Door menu



3. Press **1** to choose Open.
4. Walk into the building.
5. Look around the room. There are a couple of targets.
6. Press the Fire button on your controller or the left mouse button once to bring the weapon into the ready state. After that, press the Fire button to shoot at the targets. (See "2.2.4 Shooting at Targets" on page 15 for more target practice.)
7. Walk into other rooms. Walk up the stairs and explore the upstairs rooms.
8. When you feel confident moving the entity, return to the starting location.

2.2.2 Resetting Entities to Saved Position

If you are in Admin mode and moving entities around the scenario, you can choose to reset them to the saved position where you started. This restores their health, sets them upright, and replenishes any resources, such as fuel and munitions. You can reset the entity if you die, roll a vehicle, crash a plane, expend all of your ammunition, or are otherwise rendered unable to play.



To toggle between User mode and Admin mode, press **Shift+F12**.

➤ **To reset an entity, do one of the following:**

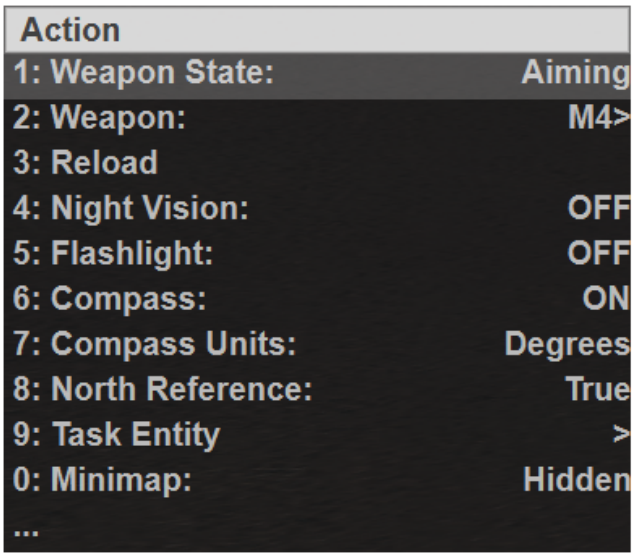
- Open the Action menu and then choose **Reset** or **Reset in Place**.
- To reset the entity to the saved position, press **F5**.
- To reset the entity at their current position, press **Ctrl+F5**.

2.2.3 The Action Menu

VR-Engage includes context-sensitive menus that open automatically, such as the one for the warehouse door (Figure 9 above). The next activity in this first experience

asks you to open the Action menu. The Action menu lets you turn several features on and off (toggles) and also lets you assign tasks to other entities when you are hosting a VR-Forces scenario or connected to a VR-Forces session.

Figure 10. Action menu



➤ **To open the Action menu, do either of the following:**

- Press **~**.
- Press the menu button on your game controller. On an Xbox controller or Gamepad, this is the Back button.

Selecting Options on the Action Menu

You can select options on the Action menu using the keyboard (arrow keys or number keys) or the D-pad on a game controller.

➤ **To select an option on the Action menu using the arrow keys or D-pad:**

1. Press the **Up arrow** and **Down arrow** keys on your keyboard or the up and down buttons on a game controller's D-pad to highlight an option.
2. Press the **Right arrow** key or the right button on the D-pad to toggle the option on or off or to display a submenu.

Also, each option on the Action menu has a number.

➤ To select an option on the Action menu using a number key, press the number associated with the menu option.

> Numbers are reassigned dynamically if you scroll the Action menu, or menu commands are removed due to some change in the state of the character. Therefore, you cannot assume that a particular number always controls the same command.

➤ To close the Action menu, press **~** or the menu button on your game controller.

2.2.4 Shooting at Targets

The default weapon is a rifle. At any point, press **R** to reload your weapon with a fresh magazine of ammunition. You can also choose Reload from the Action menu. If your magazine runs empty, your character automatically reloads without requiring input from you.

1. Open the Action menu.
2. On the Action menu, choose **Weapon State**.
3. Use an Action menu control method to toggle the Weapon State to Aiming if it is not already selected.
4. Close the Action menu.
5. Walk back out to the parking area in front of the warehouse.
6. Look at the top of the shipping containers. You see some targets.
7. Align the reticle (the white bullseye) of your gun on a target and press the left mouse button or the controller's right trigger to fire at it. Each target is knocked over when you shoot it.

Figure 11. Reticle aligned on target



8. Walk along the shipping containers, looking at the spaces between them. Watch for some enemy combatants (Figure 12).

Figure 12. Enemy combatants



9. When you see the combatants, you can fire at them. (If you walk within approximately 4 meters of the opening between the shipping containers, the combatants will attack you.)

10. To aim the rifle, hold down the **,** (comma) key, the right mouse button, or the Aim Down Sight button (left trigger) on your controller. Move the sight with the **H**, **K**, **U**, and **J** keys, the mouse, or the right thumbstick.

> In this scenario, all Friendly forces are invulnerable, including R1 USMC M4. The Opposing forces cannot kill those entities.

2.3. Drive a Ground Vehicle

To drive a vehicle, you must embark in the Driver role. You can do this by moving to a vehicle that you can drive and then, on the Action menu, selecting Driver. You can also choose this role in the Choose Role Panel for a ground vehicle entity.

Figure 13 shows the driver view.

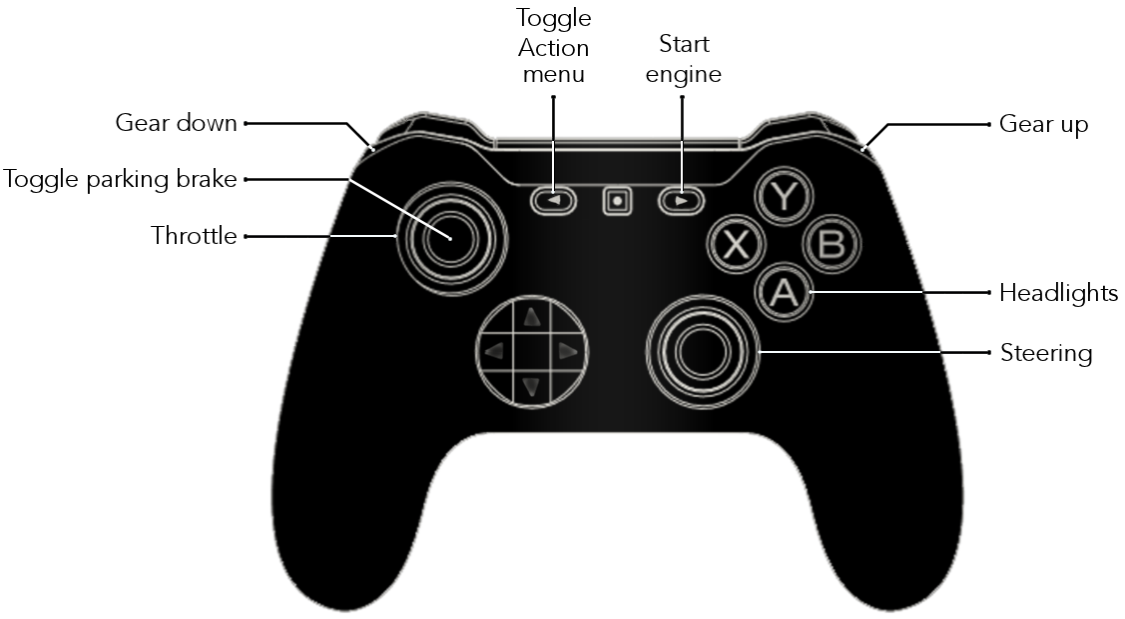
Figure 13. LAV driver view



The overlay has some important information that you need to be aware of as you drive. At the center bottom, it displays a fuel gauge, the gear, a speedometer, and a tachometer.

Refer to Figure 14 for ground vehicle driver controls on the Xbox controller.

Figure 14. Driver controls for LAV and M1A2



To drive a ground vehicle, you must start the engine, put the vehicle in gear, then use a game controller to control the throttle (forward, backward, and braking) and steering. (You can also control ground vehicles from the keyboard.)

2.3.1 Starting the Engine

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

- On a game controller, press the Start button.
- On the Racing Wheel Controller, press the Engine On button.
- Press **X** on the keyboard.

2.3.2 Putting the Vehicle into Gear

The LAV has eight forward gears and one reverse gear.

➤ To put the vehicle into gear, press the Gear Up or Gear Down buttons on your game controller or press **Q** (up) or **E** (down).

2.3.3 Controlling the Throttle

➤ To move the vehicle, press the throttle control (left thumbstick on a game controller) forward or press **W**.

➤ To brake the vehicle, pull the throttle control backwards or press **S**.

➤ On a Racing Wheel Controller, use the accelerator and brake pedals.

2.3.4 Steering a Vehicle

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

➤ On a keyboard, you can press **A** (left) or **D** (right).

2.3.5 Driving the LAV

When you put the LAV in gear, it starts to move.

By default, you are in first-person view as the driver. To get a better sense of where the LAV is in relationship to the terrain, you can repeatedly press **V** on the keyboard or the Y button on a game controller to cycle through different views of the LAV.

➤ **To drive the LAV:**

1. Turn your character and walk towards the LAV. When you get close to the LAV, the Embark LAV menu opens (Figure 15).

Figure 15. Embark LAV menu



2. Select Driver. You are now controlling the driver of the LAV. Use your game controller to drive the LAV.
3. Press the Y button to cycle through different views: two driver's views and some third-person views.
4. Press the game controller's Start button to start the engine.
5. Press the Gear Up button to put the LAV into gear.
6. Use the throttle and steering controls to drive towards the exit at the far end of the warehouse area. (You might find it easier to navigate through the area using one of the third-person views.)
7. Take a left out of the gate onto the road and drive down the road.

From the Choose Role Panel, you can engage the LAV as a Driver/Gunner, which enables you to fire the weapons on the LAV. While the Driver/Gunner can shoot as well as drive, it is also possible to have one VR-Engage player assume the role of gunner while another player is in the role of driver.

2.3.6 Physics Model

There is another LAV vehicle on the road on the right.

1. If you have not done so already, change the view of your LAV to a third-person view. (Press **V**.)
2. Drive into the vehicle and observe how the physics-based vehicle model realistically models the collision.
3. Drive onto the nearby rugged terrain and observe the individual articulation of the wheels.

2.3.7 Disengaging and Returning to the Choose Role Panel

At any point, you can stop playing as the selected entity. This allows you to choose another role or exit VR-Engage.

➤ **To return to the Choose Role panel:**

1. Press **Esc**. The Application Menu displays (Figure 16).
2. Click Choose Role. You return to the Choose Role panel (Figure 4 on page 9).

Figure 16. Application Menu



2.4. Parachute Out of a Helicopter

Paratroopers can jump from aircraft and deploy parachutes. They can steer left and right and can slow their descent. Parachutes are affected by wind.

When a you are playing a paratrooper and you jump, the view changes to a third-person view and the weapon is hidden. When the paratrooper lands, it returns to the view mode used prior to jumping and the weapon is available.

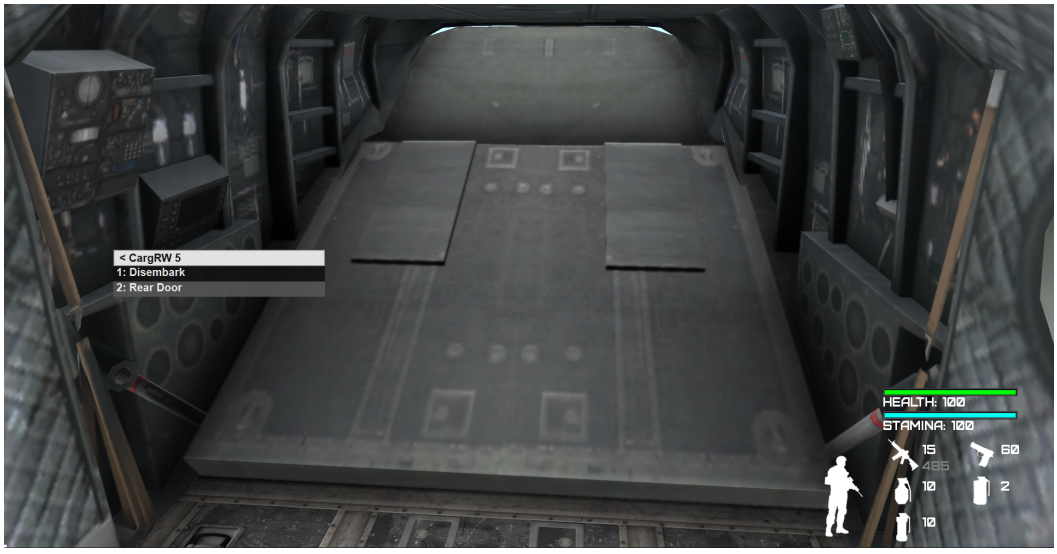
1. In the Choose Role list, select Para 1 (Paratrooper). This entity is embarked on the CargRW 5 CH-47 Chinook entity.
2. Click Engage. You are now seated in a helicopter. You can see other paratroopers seated across the aisle.

Figure 17. Seated in the helicopter



3. Press **C** or the B button on the controller to stand up.
4. Turn right and walk towards the rear of the helicopter. You must walk past all of the seats and up to the cargo door (Figure 18).

Figure 18. Cargo door closed



5. On the Action menu, select Rear Door. The cargo door opens (Figure 19).

Figure 19. Cargo door opened



6. Tip: Read Step 8 through Step 10 on the facing page before continuing so that you know how to deploy your parachute and control it before you jump out of the helicopter.

   Walk through the cargo door as far as you can. When you step off, the view changes to third person and you are falling towards the earth. The overlay shows the wind speed and direction and your altitude (Figure 20).

Figure 20. Free fall



7. After your character falls for a few hundred feet, press the **Spacebar** or the A button on your game controller to deploy the parachute (Figure 21). (If you do not deploy the parachute, or wait too long to do so, the paratrooper dies on impact.)

Figure 21. Parachute deployed



8. To steer as you descend towards the ground, press **A** or **D**, or the shoulder buttons on the game controller.
9. Press **A+D** or both shoulder buttons simultaneously to slow your rate of descent.
10. Move the mouse or the right thumbstick on the game controller to look around.
11. When you land, you return to first-person view. You do not need to gather the parachute.

2.5. Fly a Fighter Jet

So far we have looked at controlling humans and ground vehicles. Now let's try to fly a jet. The VR-Engage First Experience scenario includes planes that are already airborne that you can fly. The VR-Engage Test Drive scenario includes a jet already in flight as well as a jet on a runway so that you can take off. You can use either of them to practice landing. VR-Engage includes mappings for the Thrustmaster Warthog flight controller, the T.Flight Hotas X flight controller, and the Gamepad F310.

Figure 22 illustrates the flight controls for the T.Flight Hotas X joystick. This controller also has a throttle control. Figure 23 illustrates the flight controls for the Xbox controller.

See "4.6. Flight Controllers" on page 45 for more detailed controller information.

Figure 22. Fixed-wing T.Flight Hotas X joystick - fixed wing

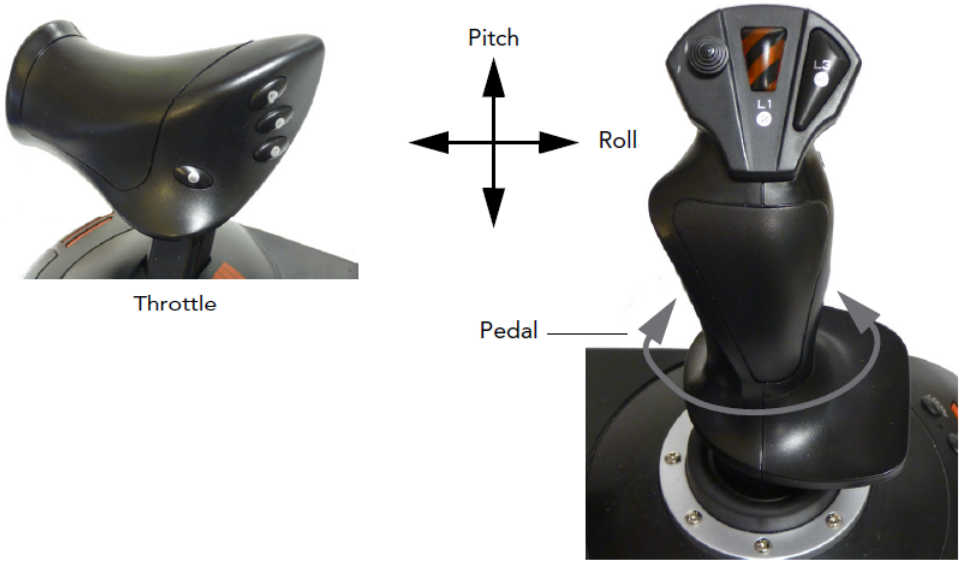
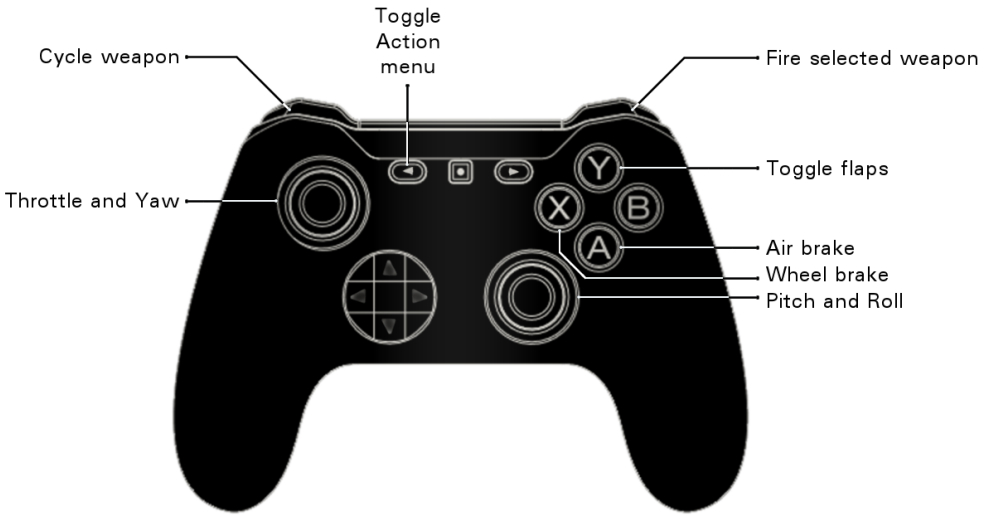


Figure 23. Fixed-wing flight controls



Controllers like the Xbox controller or Logitech Gamepad provide limited flight support. It is recommended that you use a game controller with a joystick and throttle, such as the supported Thrustmaster controllers.

The Action menu has options for raising and lowering landing gear or you can press **G**.

2.5.1 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), and heading.

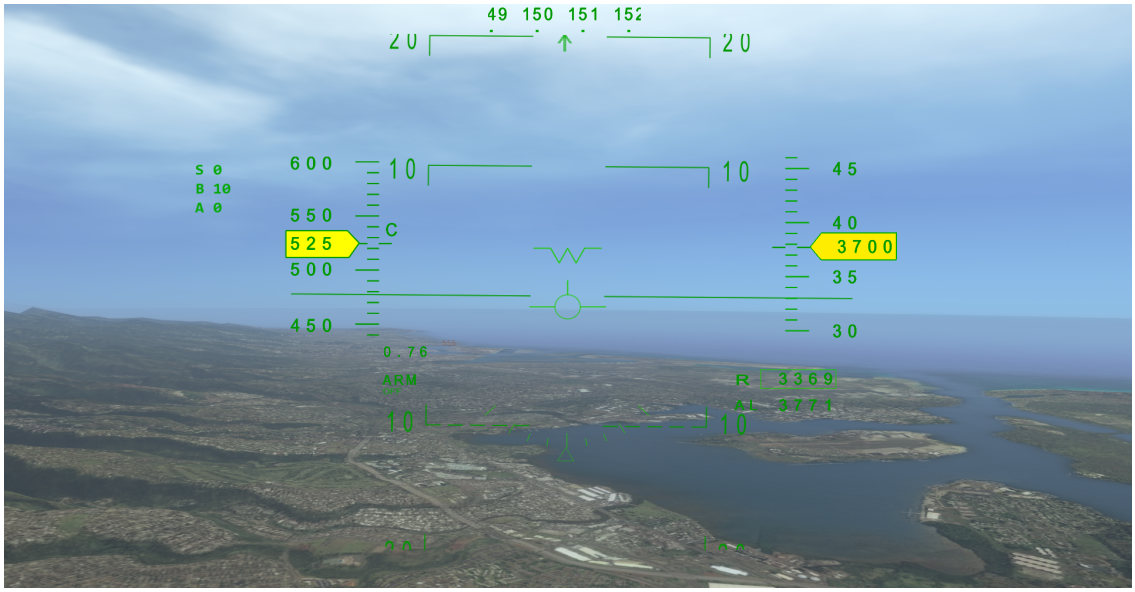
Figure 24 shows the head-up display and instrument panel for a fixed-wing aircraft in the 1 Screen Horizontal display.

Figure 24. HUD and instrument panel (1 Screen Horizontal display)



For a 2 screen display, Figure 25 shows the head-up display and Figure 26 on the next page shows the instrument panel.

Figure 25. HUD (2 Screen display)



2.5.2 The Instrument Panel

The Instruments Only display shows the instrument panel (Figure 26), which has six gauges and four multi-function displays (MFD). The 1 Screen Horizontal display shows six gauges and two MFDs on the instrument panel (Figure 24 above).

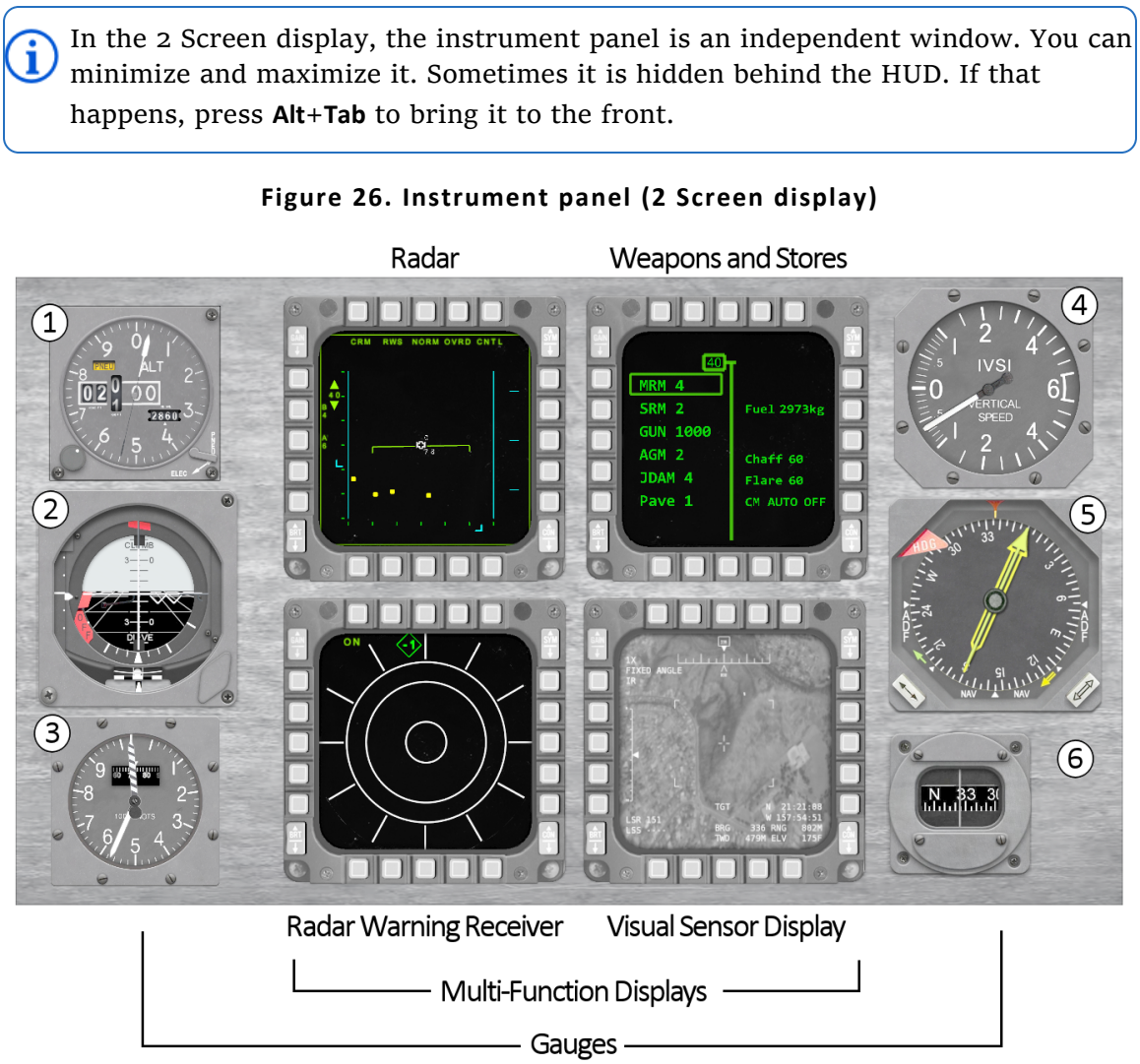


Figure 26. Instrument panel (2 Screen display)

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:

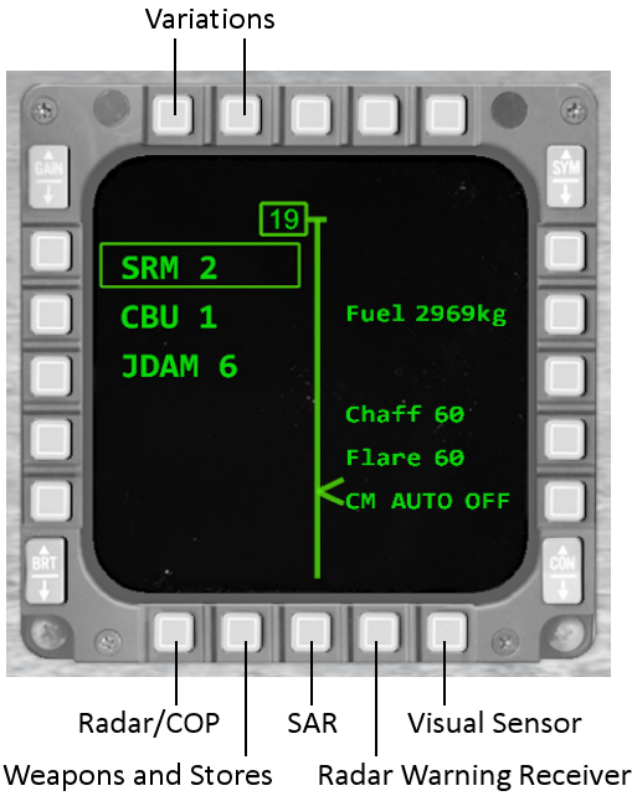
- Tactical Situation Display (Radar Indicator).
- Weapons/Stores Control Panel.
- Synthetic Aperture Radar (SAR) view.

- 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 27. Multi-function display



➤ To change the display, click one of the buttons along the bottom of the display. For Radar, Radar Warning Receiver, and Visual Sensor, clicking one of the two leftmost buttons on the top of the MRD changes the display.

If the MFD display does not change when you click the buttons, the instrument panel might not have focus. Maximize it to ensure that it has focus.

2.5.3 Taking Control of a Jet

➤ **To take control of a jet in flight:**

1. In the Choose Role Panel, select the Control an Existing Entity option.
2. In the list of entities, select FtrFW 1 F/A-18 Hornet.

3. If you are using two monitors, in the Display(s) list, select 2 Screen. If you are using one monitor, select 1 Screen Horizontal.
4. Click Engage. The screen changes to show a HUD and an instrument panel. (If you just have one monitor and choose 2 Screen, the HUD will probably obscure the instrument panel. Press **Alt**+**Tab** to display the instrument panel.)

   When you engage an entity that is flying, keep an eye on your speed and altitude to ensure that you do not crash.

5. Fly around the region, changing air speed, altitude, and heading, as follows:
   a. Move the throttle or the left thumbstick forward to increase your air speed. Pull them back to reduce air speed.
   b. Move the joystick or the right thumbstick forward and back to control the elevator on the aircraft. This changes the pitch up or down. If the aircraft is level, this results in an increase or decrease in altitude.
   c. Move the right thumbstick right or left, or twist the joystick to control the ailerons. This causes the aircraft to bank left or right.
   d. Refer to the head-up display or the instrument panel to determine your speed, pitch, and roll.

2.5.4 Taking Off and Landing in a Jet

The jet on the runway has its flaps up. If you want to shorten the distance required to take off, you can use the Action menu to lower the flaps. This is not required, however, because the runway is more than long enough for a fighter jet to take off.

➤ **To take off:**

1. If VR-Engage is not running, start it and load the VR-Engage Test Drive scenario. If it is running, start a new session, as follows:
   a. Press **Esc** to display the Application Menu.
   b. Click Choose Session.
   c. Click Yes in the confirmation message. You return to the Searching for a Session screen.
   d. Click Host Session.
   e. Select the VR-Engage Test Drive scenario and click then Load Scenario.
2. In the Choose Role Panel, select the Control an Existing Entity option.
3. In the list of entities, select FtrFW 2 F/A-18 Hornet.
4. Click Engage. The display changes to full screen mode and the scenario starts to run. The jet is on the runway at the Honolulu airport.
5. Use the throttle to accelerate down the runway. Takeoff speed is about 150 mph, less if you lower the flaps.

6. When you reach takeoff speed, pull back on the joystick or use the game controller pitch control to raise the nose. The plane takes off.
7. Use the Action menu or the Landing Gear button on the joystick to raise the landing gear.
8. Fly the plane as desired.

➤ **To land the jet:**

1. Fly around the region until you can line up the aircraft with the runway.
2. Use the Action menu or the Landing Gear button to lower the landing gear.
3. Use the Action menu, the Flaps button on the throttle, or game controller Y button to lower the flaps. This reduces speed and also lowers the speed at which the aircraft will stall, thereby giving you more leeway for landing.
4. Reduce speed and lower altitude as you approach the runway. To reduce speed, pull back on the throttle, use the air brake (A button on your game controller), or both. The goal is to get below takeoff speed and go as slowly as possible without stalling.
5. Touch down on the runway, keeping the nose higher than the rear of the plane so that the rear wheels touch down first.
6. Use the wheel brake (X button) to stop the plane.



This is much easier to say than to do. You will have to practice until you get a feel for how the plane handles.



3. The Security Checkpoint Scenario

The Security Checkpoint scenario is an example of how you can use VR-Engage to set up a focused training environment.

3.1. Introduction to the Security Checkpoint Scenario 32
3.1.1 Load the Security Checkpoint Scenario 32
3.1.2 Opening the Security Panel 33
3.1.3 Using the Security Panel 33
3.2. Adding Security Checkpoints to a VR-Forces Scenario 34

3.1. Introduction to the Security Checkpoint Scenario

The Security Checkpoint scenario has a security checkpoint (Figure 28) consisting of:

- A security booth.
- Two gates with articulated arms.
- Gimbaled cameras mounted on poles.
- Traffic lights.

Figure 28. Security checkpoint



The checkpoint is manned by guards. If you engage the scenario as a guard, when you enter the gatehouse, you can open a security panel. Use the panel to move the cameras and raise and lower the gates. The traffic lights are dynamic. When a gate is raised, the light is green. When it is lowered, the light is red.

The scenario uses the VR-Forces pattern of life feature to generate traffic. When a gate is down, cars that approach the gate come to a stop. If the gate is up, they drive through the checkpoint.

3.1.1 Load the Security Checkpoint Scenario

➤ **To load the Security Checkpoint Scenario**

1. If VR-Engage is not running, start it.

   If it is running, change the session:

   a. Access the Application Menu and then click Choose Session.

   b. Click Yes to confirm that you want to leave the session.

2. Click Host VR-Forces Session. The list of scenarios displays.
3. Select VR-Engage Security Checkpoint.

4. Click Load Scenario. The terrain and scenario load. The Choose Role Panel displays.
5. Select Guard 1.
6. Click Engage. You are inside the guard house and the Security Station menu is open.

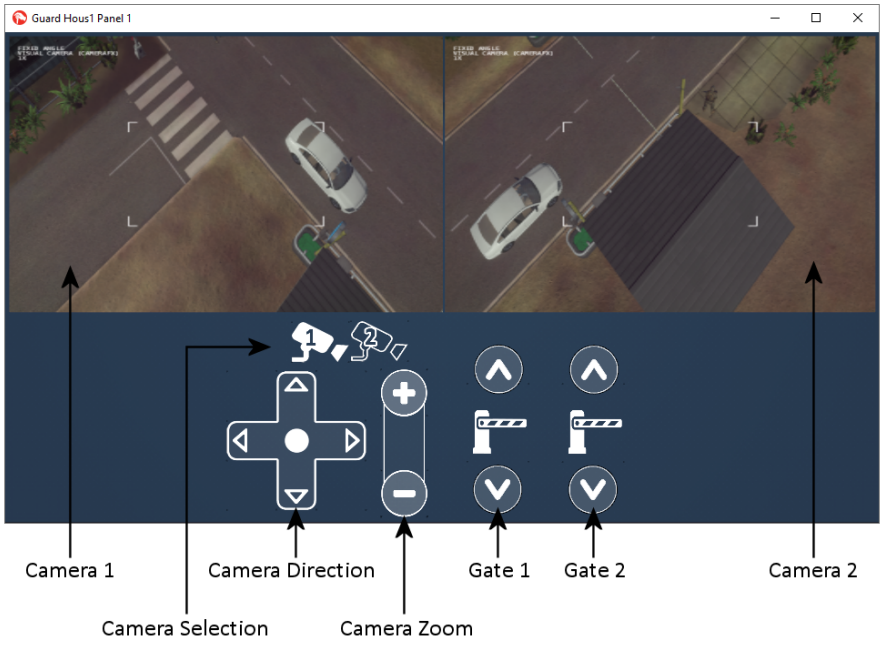
3.1.2 Opening the Security Panel

If you are playing the role of a security guard, you can open the security panel and manipulate its controls.

➤ **To open the security panel:**

1. On the Action menu, select Open Security Panel. The security panel opens (Figure 29).

Figure 29. Security panel



The security panel may open behind the main VR-Engage window. To see it, press **Alt**+**Tab** to select it or press **Ctrl**+**Enter** to change to windowed mode and then select the window. You can also simply drag the security panel to a different monitor or location in the window.

3.1.3 Using the Security Panel

You control the security panel with your mouse. If you do not see the cursor, press **Ctrl** to disable mouse control.

Using the security panel (Figure 29), you can:

- Move the security cameras.
- Zoom the camera view.
- Raise and lower the gates.

➤ To move a camera, select the icon for the camera you want to control. Then click the directional arrows.

➤ To zoom a camera in or out, click the zoom controls.

➤ To raise or lower a gate, click the Up or Down arrow.

➤ To close the security panel, click the Close button (X) on the title bar.

3.2. Adding Security Checkpoints to a VR-Forces Scenario

The security booth and gates are created in VR-Forces as a simulation object group. The VR-Engage Add-ons for VR-Forces installs the following four versions of the security checkpoint that you can use to build your own scenarios:

- Security booth and one gate for driving on the right side of the road.
- Security booth and one gate for driving on the left side of the road.
- Security booth and two gates for driving on the right side of the road.
- Security booth and two gates for driving on the left side of the road.



4. Mouse, Keypad, and Controller Mappings

This chapter describes mouse and keyboard mappings and controller mappings for VR-Engage. You can use other controllers. To do so, you must create a configuration for each controller. For details, see "Configuring Joysticks and Keyboard Control" in the *VR-Engage Users Guide*.

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4.1. Mouse and Keyboard Mappings

Using the mouse and keyboard, you can control human characters, ground vehicles, and navigate the Action menu. You can also perform some aircraft behaviors.

4.1.1 Application Management

Table 1 lists mouse and keyboard mappings for all roles in VR-Engage.

Table 1. Keyboard controls in all roles

Function	Key
Open display of gamepad and keyboard controls	F1
Open HTML help	Shift+F1
Toggle Action menu	~ (tilde)
Toggle full screen	Ctrl+Enter
Disable/enable mouse control	Ctrl
Exit to Application Menu / close Action menu	Esc
Toggle between Admin and User modes	Shift+F12
Reset to starting position (Admin mode only, scenario continues to run)	F5
Reset in current position (Admin mode only, scenario continues to run)	Ctrl+F5

4.1.2 Action Menu Controls

Table 2 lists keyboard controls for the Action menu.



You can use the corresponding number to select items in the Action menu, but that this number changes when you scroll through the list. For example, 1 does not always toggle the weapon state.

Table 2. Action menu mouse and keyboard mappings

Mouse Mappings	
Select menu item	Number matching menu item Mouse click (when mouse control is disabled)
Keyboard Mappings	
Toggle Action menu	~ (tilde)
Next menu item	Up arrow
Previous menu item	Down arrow
Select menu item	Right arrow or Enter
Return to previous menu	Left arrow

4.1.3 Human Controls

Table 3 lists mouse and keyboard mappings for human players.

Table 3. Human player mouse and keyboard controls

Function	Key / mouse movement
Mouse Mappings	
Turn / move weapon	mouse move
Aim	right mouse button
Fire	left mouse button
Zoom in (binoculars / minimap)	mouse wheel forward
Zoom out (binoculars / minimap)	mouse wheel backward
Keyboard Mappings	
Movement	
Run forward	W
Sprint forward	left Shift+W
Walk forward	left Alt+W
Run backward	S
Sprint backward	left Shift+S
Walk backward	left Alt+S
Turn left	H
Turn right	K
Posture up	Q
Posture down	E
Stand	C
Lay prone	Z
Toggle view mode (first- / third-person)	V
Parachuting	
Deploy parachute	Spacebar
Steer left or right	A or D
Slow rate of descent	A+D
Engagement	
Aim	, (comma)
Strafe left	A
Strafe right	D
Pitch weapon/look up	U
Pitch weapon/look down	J

Table 3. Human player mouse and keyboard controls (continued)

Function	Key / mouse movement
Toggle Weapon State (Stowed, Ready, Aiming)	' (apostrophe)
Cycle weapons	Spacebar
Select weapon	1, 2, 3, and so on (not on number pad)
Reload weapon	R
View and Accessories	
Look (weapons are disabled while looking)	. (period) + arrow keys or mouse
Toggle night vision goggles	N
Toggle binoculars	B
Zoom in	=
Zoom out	- (dash, not on number pad)
Talk on the radio	T
Toggle flashlight	F
Toggle compass	G
Toggle minimap	M
Zoom in on minimap	+ (plus sign on number pad)
Zoom out of minimap	- (minus sign on number pad)
Reset minimap zoom	0 (number pad)

4.1.4 Ground Vehicle Controls

Table 4 lists keyboard controls for ground vehicles.

Table 4. Keyboard mappings for ground vehicles

Function	Key / mouse movement
Movement and view (driver role)	
Start/stop engine	X
Throttle	W
Brake	S
Steer left	A
Steer right	D
Shift gear up	Q
Shift gear down	E
Parking brake	P

Table 4. Keyboard mappings for ground vehicles (continued)

Function	Key / mouse movement
Headlights	L
Differential lock (LAV) Pivot (tanks)	C
Cycle saved views	V
Specify saved view	1, 2, 3, 4, 5, 6 (as defined)
Engagement (gunner and driver/gunner roles)	
Move turret (gunner)	mouse move
Fire weapon (gunner)	left mouse button
Cycle sensor	M
Turret left	H
Turret right	K
Turret up	U
Turret down	J
Next weapon	R
Previous weapon	V
Fire	F
Commander RWS role	
Look	mouse move
Toggle laser designator	L
Slew to cue	C
Gunner override	O
Cycle sensor	M
Reset sensor	R
Zoom Mappings (commander and gunner only)	
Zoom in	I / mouse wheel forward
Zoom out	Y / mouse wheel backward

4.1.5 Aircraft Controls

Table 5 lists the keyboard mappings for aircraft. You require another controller to fly the aircraft. See "4.6. Flight Controllers" on page 45.

Table 5. Keyboard mappings for fixed-wing aircraft

Function	Key
Toggle radar warning receiver	M
Observer mode	V
Toggle landing gear	G
Suppress warnings	Spacebar
Engagement	
Cycle weapons	A
Move radar cursor up	I
Move radar cursor down	K
Move radar cursor left	J
Move radar cursor right	L
Select target closest to cursor	Z
Unselect target closest to cursor	X
Cycle target list backward	Y
Cycle target list forward	T
Clear air target list	U
Countermeasures	
Launch chaff	C
Launch flares	F

4.2. Game Controller Mappings for Using the Action Menu

Figure 30 on the facing page illustrates the game controller numbering and naming conventions.

Table 6 lists the controls for using the Action menu.

Table 6. Game controller mappings - Action menu

Function	Game Controller Key / Button	Button / Axis
Toggle Action menu	Back button	Button 4
Move in menu	D-pad	Buttons 11, 12, 13, and 14
Select	A	Button 0

4.3. Game Controller Mappings for Human Control

Figure 30 illustrates the game controller numbering and naming conventions.

Figure 30. Generic game controller button conventions

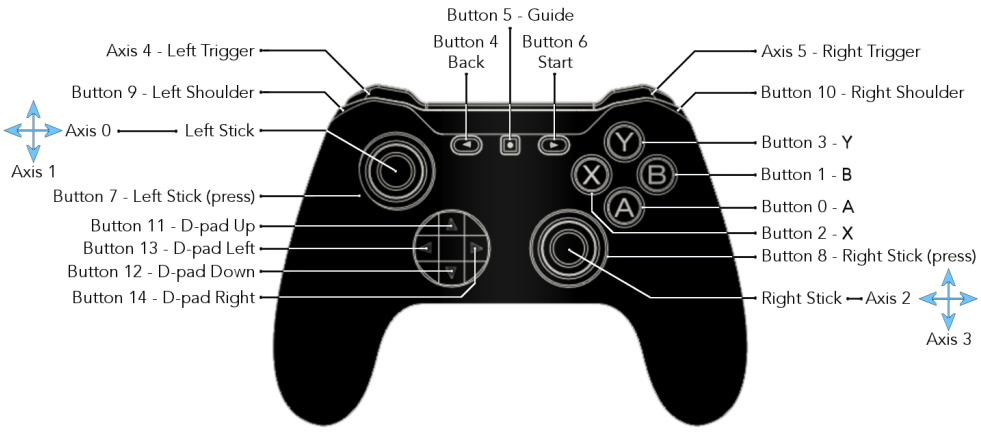


Table 7 lists the game controller buttons for human characters.

Table 7. Game controller mappings - human

Function	Game Controller Key / Button	Button / Axis
Movement and view		
Move	left thumbstick	Axis 0 and Axis 1
Sprint	left thumbstick (press)	Button 7
Rotate eyepoint	right thumbstick	Axis 2 and Axis 3
Free look	right thumbstick (press)	Button 8
Posture select	B button	Button 1
Toggle binoculars	X button	Button 2
Zoom binoculars in or out	right shoulder button left shoulder button	Buttons 9 and 10
Talk on radio	A button	Button 0
Toggle night vision goggles	D-pad down	Button 12
Human Combat		
Aim	left trigger	Axis 4
Fire/lase target	right trigger	Axis 5
Cycle weapons	Y button	Button 3
Parachuting (paratroopers only)		
Deploy parachute	A button	Button 0

Table 7. Game controller mappings - human (continued)

Function	Game Controller Key / Button	Button / Axis
Steer left or right	left or right shoulder button	Button 9 or 10
Slow rate of descent	both shoulder buttons simultaneously	Buttons 9 and 10

4.4. Game Controller Mappings for the LAV and Tanks

Figure 30 on the previous page illustrates the game controller numbering and naming conventions.

Table 8 lists the driver's controls for the LAV and tanks.

Table 8. Driver game controller mappings - LAV and tanks

Function	Game Controller Key / Button	Button / Axis
Vehicle Control		
Start/stop engine	Start button	Button 6
Throttle	left thumbstick	Axis 1
Shift gear up	right shoulder button	Button 10
Shift gear down	left shoulder button	Button 9
Steering	right thumbstick	Axis 2
Differential lock (LAV) Pivot (tanks)	X button	Button 2
Headlights	A button	Button 0
Parking brake	left thumbstick (press)	Button 7
Cycle saved views	Y button	Button 3
Engagement		
Change sensor	right thumbstick (press)	Button 8
Turret (gunner)	right thumbstick	Axis 2 and 3
(gunner/driver)	D-pad	Buttons 11, 12, 13, and 14
Cycle weapon (driver)	left trigger	Axis 4
Next weapon (gunner)	left trigger	Axis 4
Previous weapon (gunner)	D-pad up	Button 11
Fire weapon	right trigger	Axis 5

Table 9 lists the commander's controls for the LAV and tanks. (Not all tanks are configured with commander roles.)

Table 9. Commander game controller mappings - LAV and tanks

Function	Game Controller Key / Button	Button / Axis
Rotate/elevate camera	right thumbstick	Axis 2 and Axis 3
Change sensor	D-pad down	Button 14
Zoom out	left shoulder button	Button 9
Zoom in	right shoulder button	Button 10
Slew to cue (Commander RWS only)	X button	Button 2
Gunner override (Commander RWS only)	Y button	Button 3
Toggle Laser Designator (Commander RWS only)	A button	Button 0

Table 10 lists the gunner's controls for the LAV and tanks.

Table 10. Gunner game controller mappings - LAV and tanks

Function	Game Controller Key / Button	Button / Axis
Rotate/elevate gun	right thumbstick	Axis 2 and Axis 3
Change sensor	right thumbstick (press)	Button 8
Zoom out	left shoulder button	Button 9
Zoom in	right shoulder button	Button 10
Next weapon	left trigger	Axis 4
Previous weapon	D-pad up	Button 11
Fire weapon	right trigger	Axis 5

4.5. Racing Wheel Controllers

VR-Engage supports the Logitech G27 and G29 racing wheel controllers.



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

Figure 31 illustrates the mappings of the G27 racing wheel.

Figure 31. G27 racing wheel controls



Table 11 lists the G27 racing wheel controls.

Table 11. G27 Racing Wheel control mappings

Function	Key/Button
Next View	Button 4 Down Toggle
Previous View	Button 3 Down Toggle
Cycle Sensor	Button 16 Down Toggle
Brake	Axis 3
Differential Lock	Button 7 Down Toggle
Engine Enable	Button 8 Down Toggle
Gear Down	Button 6 down Toggle
Gear Up	Button 5 Down Toggle
Headlights	Button 20 Down Toggle
Parking Brake	Button 22 Down Toggle
Reset	Button 23 Down Toggle
Steering	Axis 1
Throttle	Axis 2

Figure 32 illustrates the mappings of the G29 racing wheel.

Figure 32. G29 racing wheel controls

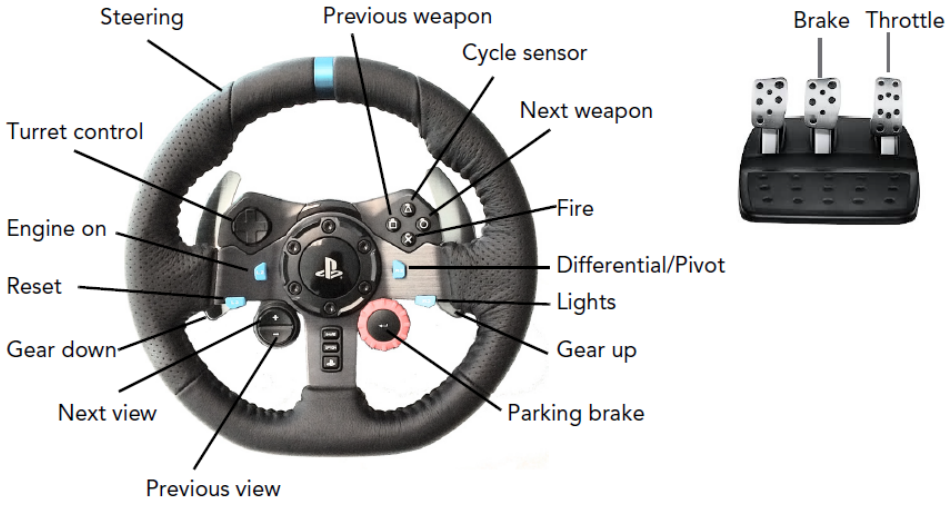


Table 12 lists the G29 racing wheel controls.

Table 12. G29 racing wheel control mappings

Function	Key/Button
Next View	Button 20 Down Toggle
Previous View	Button 21 Down Toggle
Cycle Sensor	Button 4 Down Toggle
Brake	Axis 3
Differential Lock	Button 7 Down Toggle
Engine Enable	Button 8 Down Toggle
Gear Down	Button 6 down Toggle
Gear Up	Button 5 Down Toggle
Headlights	Button 11 Down Toggle
Parking Brake	Button 24 Down Toggle
Reset	Button 12 Down Toggle
Steering	Axis 1
Throttle	Axis 2
Differential Lock	Button 7 Down Toggle

4.6. Flight Controllers

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

4.6.1 HOTAS Warthog Mappings for Fixed-Wing Entities

Figure 33 and Figure 34 show the mappings for the Thrustmaster Warthog flight controller for fixed-wing entities.

Figure 33. Thrustmaster HOTAS Warthog joystick mappings - fixed-wing



Figure 34. Thrustmaster HOTAS Warthog throttle mappings - fixed-wing

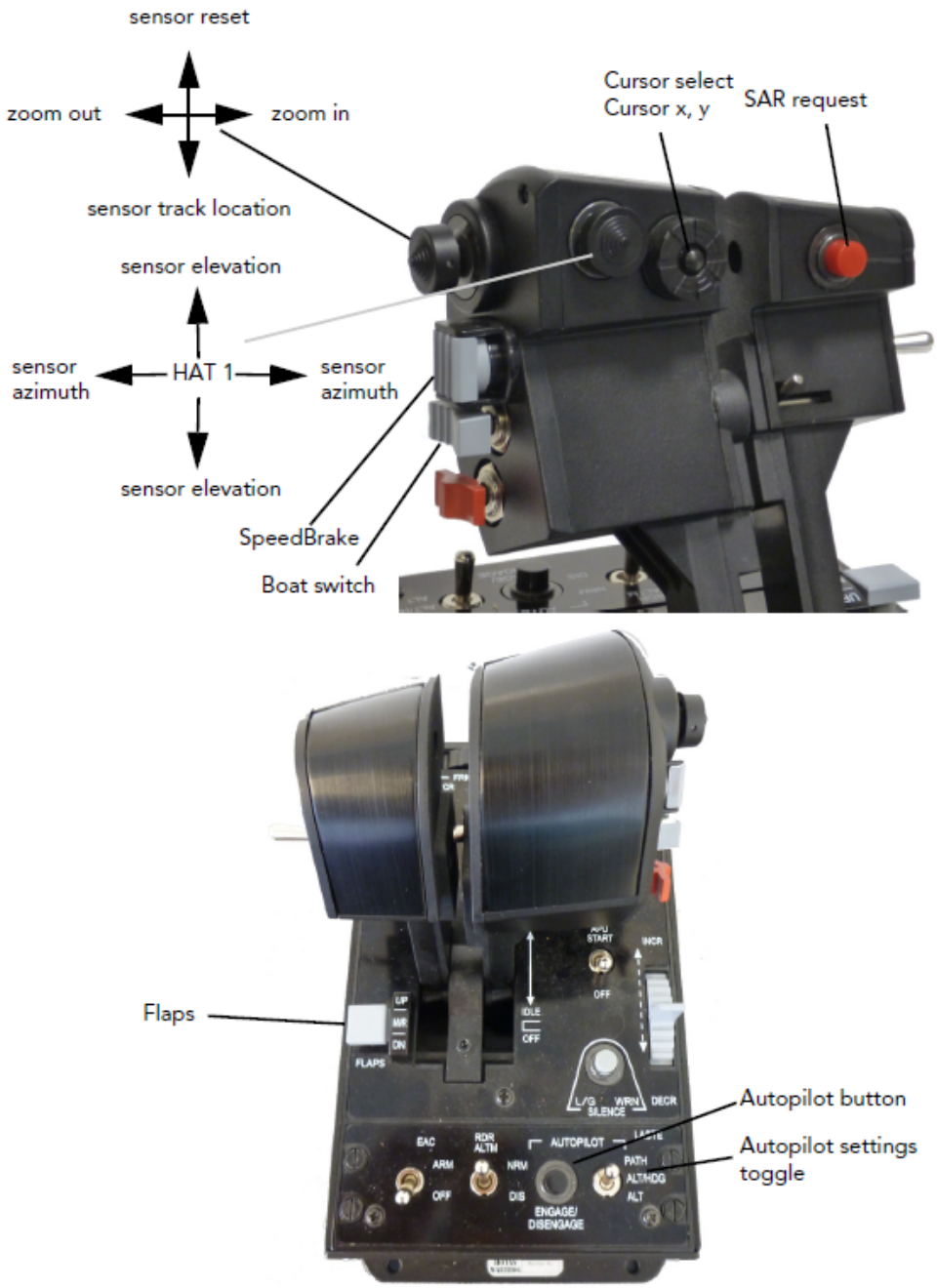


Table 13 lists the flight controls for the Thrustmaster HOTAS Warthog controller for fixed-wing entities.

Table 13. Thrustmaster HOTAS Warthog mappings - fixed-wing

Function	Key/Button
Extended Flight Controls	
AutopilotMode1	Throttle Button 27 Down Toggle
AutopilotMode2	Throttle Button 28 Down Toggle
AutopilotToggle	Throttle Button 26 Down Toggle
Flap 1	Throttle Button 22 Down Toggle. Toggle states match joystick up, maneuver, down.
Flap 2	Throttle Button 23 Down Toggle. Toggle states match joystick up, maneuver, down.
NoseWheelSteering	Button 3 Down Toggle
ToggleLandingGear	G Toggle
Engagement	
cycle weapon	Throttle Button 5 Down Toggle
fire selected weapon	Throttle Button 1 Down Toggle
replenish fuel and ordnance	Throttle Button 4 Down Toggle
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 re-centers. 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-cycle	Joystick Button 7 Down Toggle
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)
Observer Control	
ObserverAttachMode	V (on the keyboard)
Radar Scope	
cursor-select	Button 1 (also clears the selection from the air target list)

Table 13. Thrustmaster HOTAS Warthog mappings - fixed-wing (continued)

Function	Key/Button
cursor-x	Axis 1
cursor-y	Axis 2
Clear air target list	U (on the keyboard)
SAR	
request	Throttle Button 15

4.6.2 T.Flight Hotas X Mappings for Fixed-Wing Entities

Figure 35 shows the joystick controls for the T.Flight Hotas X flight controller for fixed-wing entities.

VR-Engage also supports the T.Flight Hotas 4 controller. The button layout is similar to the T.Flight Hotas X.

Figure 35. T.Flight Hotas X joystick - fixed wing



Figure 36 shows the throttle controls for the T.Flight Hotas X flight controller for fixed-wing entities.

Figure 36. T.Flight Hotas X throttle - fixed-wing

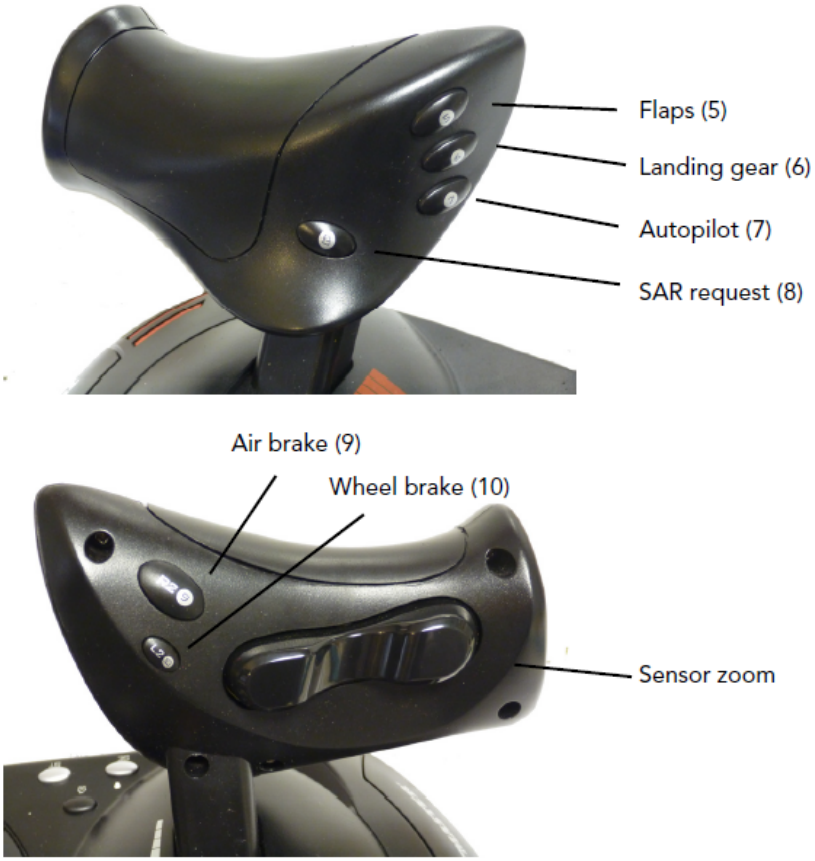


Table 14 lists the flight controls for the T.Flight Hotas X controller for fixed-wing entities.

Table 14. T.Flight Hotas X mappings - fixed-wing

Function	Key/Button
Engagement	
cycle weapon	Button 5 Down Toggle
fire selected weapon	Button 1 Down Toggle
cursor select target	Button 3 Down Toggle
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)
autopilot	Button 7
air brake	Button 9 Down

Table 14. T.Flight Hotas X mappings - fixed-wing (continued)

Function	Key/Button
landing gear	Button 6
flaps	Button 5
wheel brake	Button 10 Down
Menu	
Action menu	Button 4 Down
down	HAT 1 Down, <DOWN>
left	HAT 1 Left, <LEFT>
right	HAT 1 Right, <RIGHT>
up	HAT 1 Up, <UP>
Observer Control	
Attach mode	V (on keyboard)
Radar Scope	
down	HAT 1 Down, <DOWN>
left	HAT 1 Left, <LEFT>
right	HAT 1 Right, <RIGHT>
up	HAT 1 Up, <UP>
select target closest to cursor	Z (on keyboard)
clear current radar selection	X (on keyboard)
Release Bomb	
release	Button 1 Down
SAR	
request	S, Button 8 Down

4.6.3 Game Controller Flight Control Mappings for Fixed-Wing Entities

Figure 30 on page 41 illustrates the game controller numbering and naming conventions.

Table 15 lists the flight controls for fixed-wing entities.

Table 15. Game controller flight control mappings - fixed-wing

Function	Game Controller Key / Button	Button / Axis
Engagement		
Cycle weapons	left trigger	Axis 4
Fire weapon	right trigger	Axis 5

Table 15. Game controller flight control mappings - fixed-wing (continued)

Function	Game Controller Key / Button	Button / Axis
Radar cursor select	left shoulder button	Button 9
Radar cursor	D-pad	Buttons 11, 12, 13, 14
Flight Controls		
Pedal	left thumbstick (forward/back)	Axis 0
Throttle	left thumbstick (forward/back)	Axis 1
Pitch	right thumbstick (forward/back)	Axis 3
Roll	right thumbstick (left/right)	Axis 2
Air brakes	A button	Button 11
Wheel brakes	X button	Button 13
Flaps	Y button	Button 0
Auto pilot	right shoulder button	Button 10

4.7. Head-Mounted Display Controllers

The Oculus Rift and HTC Vive head-mounted displays support hand controllers. This section shows the mappings for these controllers, which can be used for soldier roles. If you do not have hand controllers, you can use a keyboard, Xbox controller, or Logitech Gamepad. (HMD hand controllers are not mapped in joystick settings.)

Figure 37 illustrates the controls on the Oculus Rift touch controller.

Figure 37. Oculus Rift touch controller

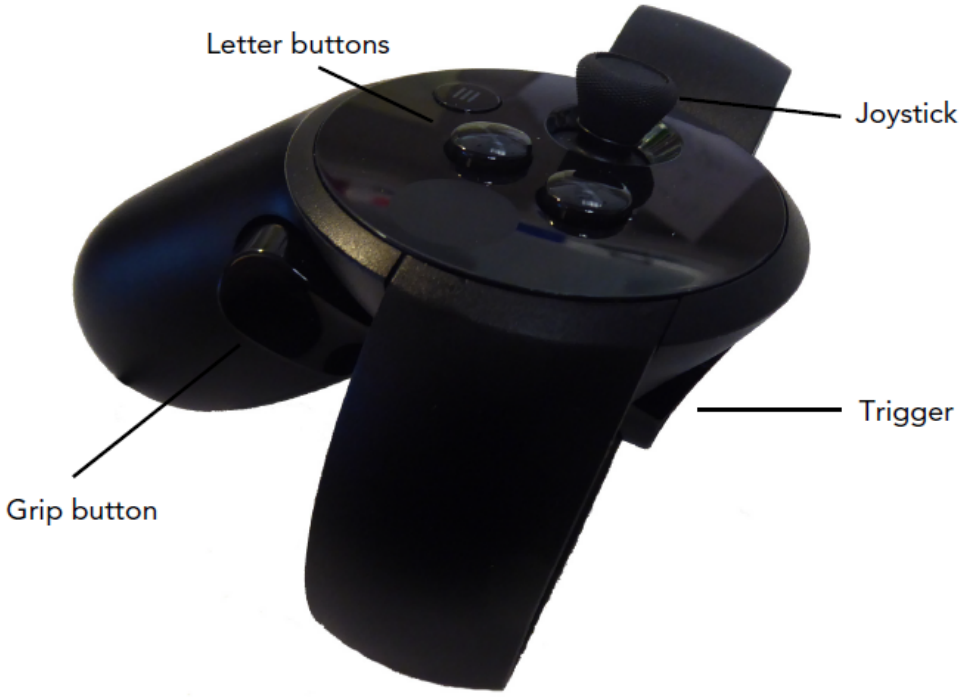
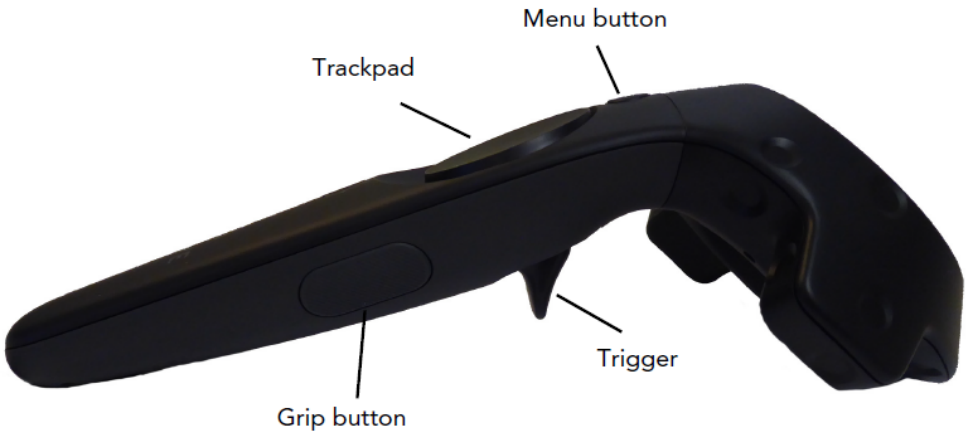


Figure 38 illustrates the controls on the Oculus Rift touch controller.

Figure 38. HTC Vive controller



The controls work as follows:

- Fire. Press the trigger on the dominant hand to fire the weapon.
- Aim. Press the grip button to raise the weapon to the aim-down-sights position.
- Move. Movement is controlled by the right hand joystick (Oculus Rift) or trackpad (HTC Vive), as follows:

  - Walk forward. Push/touch forward. Movement is based on the orientation of the entity, not the direction it is looking or aiming.
  - Walk backwards. Pull/touch backward.
  - Walk sideways. Push/touch left and right
  - Sprint. Push down while pressing forward.
- Turn. Press/touch the left hand joystick or trackpad to the left or right.
- Change posture. Press the trigger on the non-dominant hand for Posture Up. Press the grip button on the non-dominant hand for Posture Down.
- Action menu. To open, press Y on the non-dominant hand Oculus touch controller. Press the menu button on the non-dominant hand HTC Vive controller. While the menu is open, the joystick or trackpad acts as a D-pad.

4.8. Game Controller Button Numbering

Each trigger and joystick direction is considered to be an axis and can be mapped to a joystick control. Everything else is a button and can be mapped to a button control. Game controllers are mapped in *.lua* files. (For details, see "Configuring Joysticks and Keyboard Control" in the *VR-Engage Users Guide*.) The mappings are identified by button and axis numbers. Figure 39 and Figure 40 identify the button and axis numbering scheme for the Xbox and Gamepad controllers.

Figure 39. Xbox controller button and axis numbering



Figure 40. Logitech Gamepad button and axis numbering

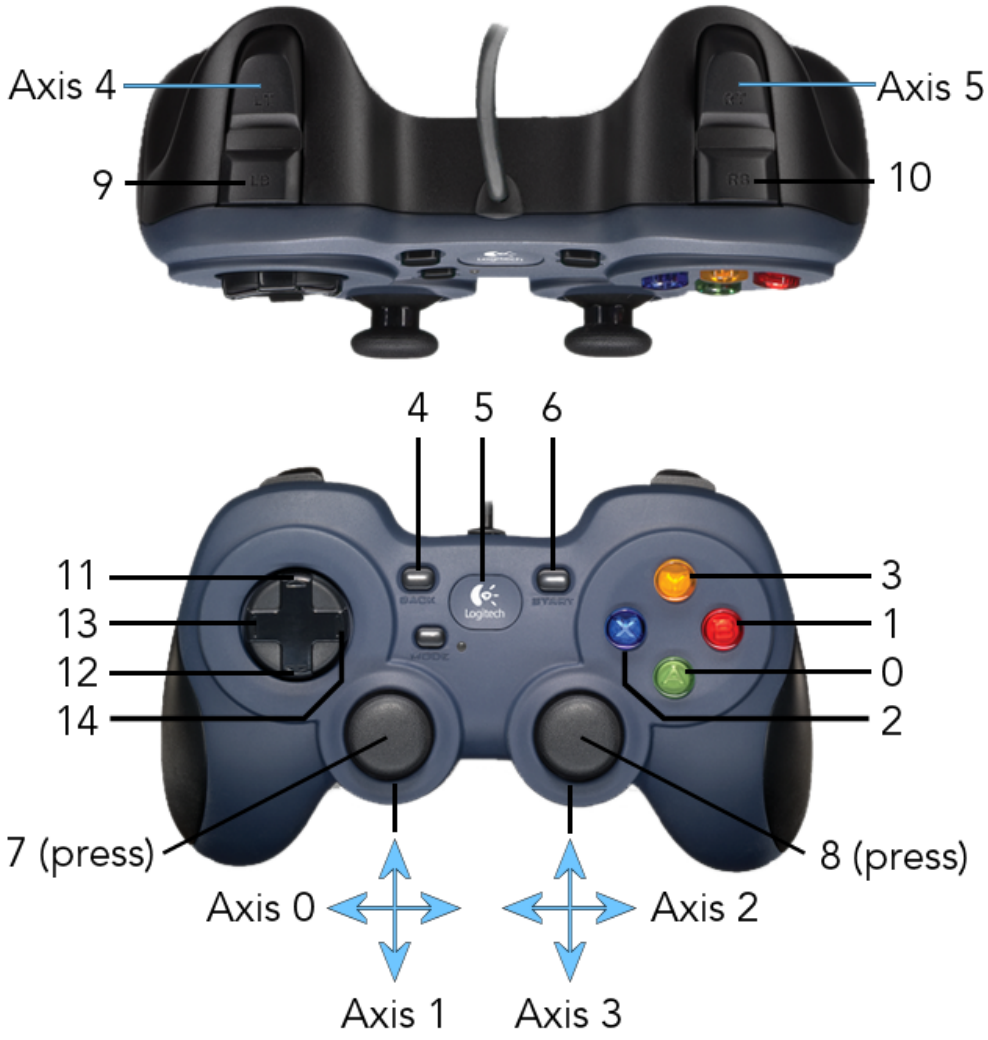


Table 16. Controller numbering

Number	Description
Button	
0	Xbox A or corresponding
1	Xbox B or corresponding
2	Xbox X or corresponding
3	Xbox Y or corresponding
4	Xbox Back or corresponding
5	Xbox Guide or corresponding
6	Xbox Start or corresponding
7	Left stick press
8	Right stick press

Table 16. Controller numbering (continued)

Number	Description
9	Left shoulder button
10	Right shoulder button
11	D-pad up
12	D-pad down
13	D-pad left
14	D-pad right
15	Miscellaneous (Xbox Series X share button, PlayStation 5 microphone button, Nintendo Switch Pro capture button, Amazon Luna microphone button)
16	Xbox Elite paddle P1
17	Xbox Elite paddle P1
18	Xbox Elite paddle P1
19	Xbox Elite paddle P1
20	PlayStation 4 / PlayStation 5 touchpad button
Axis	
0	Left stick x axis
1	Left stick Y axis
2	Right stick x axis
3	Right stick y axis
4	Left trigger
5	Right trigger



5. Installation and Licensing

Your MAK salesperson has given you links to the VR-Engage installers, and may have given you links to other installers. Download the files.

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5.1. Installing VR-Engage

VR-Engage has an application installer and a data installer. Use the data installer to install the data package. You should install all of the data packages to go through the VR-Engage first experience.

VR-Engage also has a supplementary installer that includes a set of plug-ins for VR-Forces. If you are installing a VR-Forces build that is compatible with VR-Engage and want to take advantage of VR-Engage/VR-Forces integration, you must install the plug-ins.

Before you install the applications, note the following possible issues:

- When you install VR-Engage, 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. If you experience this problem, turning off User Access Control can reduce or eliminate this delay.
- These instructions assume you are familiar with installing Windows applications that use a wizard-style installer. They also assume that you have an unzipping application and know how to use it.

➤ **To install VR-Engage:**

1. Run the VR-Engage application installer. It opens an installation wizard.
2. The default installation directory displays. If necessary, change the location. Click Next.
3. Click Next in the Select Components page.
4. The default directory for the shortcut displays. If necessary, change the location. Click Next.
5. Continue with the installation wizard by clicking Install.
6. When the installation is complete, the wizard informs you how to install the VR-Forces plug-ins. Click Next.
7. Click Finish.
8. Optionally, install the VR-Forces and VR-Engage plug-ins as described in "5.1.1 Installing Compatible VR-Forces and VR-Engage Add-ons" on the facing page.



You must install the data package. It is not optional. VR-Engage does not run properly without it.

➤ **To install the data:**

1. Install the MAK Software Manager.
2. Run the MakSoftwareManager executable in the *.\bin64* folder.

   On Windows 10, you can also open the Start menu and then choose **MAK Technologies > MAK Software Manager**.
3. Click Install in the welcome page.

4. Specify the directory where you saved the data files. The default is your Downloads folder, but you can click the folder icon to navigate to another folder.
5. Select the data files that you want to install.

> You must install the Core data for VR-Engage to function. To have access to other terrains and to see anything other than notional models, install the other data packages provided by MAK Technologies. If you do not install any other data, it is assumed that you are providing your own models and terrains.

6. Click Install. The MAK Software Manager shows the progress of the data installation.
7. When the installation is complete, click Exit.

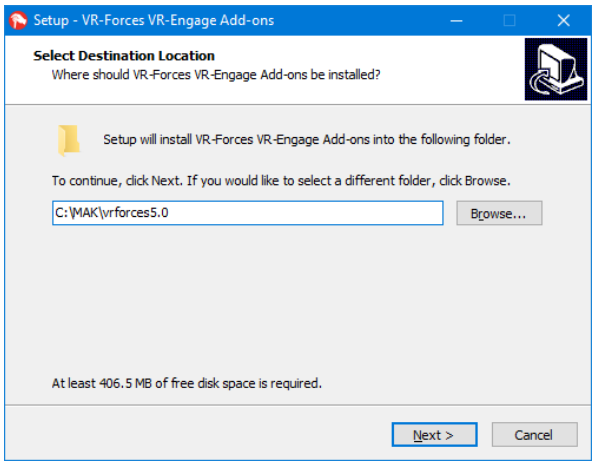
5.1.1 Installing Compatible VR-Forces and VR-Engage Add-ons

VR-Engage is a standalone application that can interoperate with any simulation using DIS or HLA. If you have installed a version of VR-Forces that is compatible with VR-Engage and you install the VR-Engage plug-ins, however, you can control VR-Forces simulation objects from VR-Engage.

➤ **To install VR-Forces and the VR-Engage add-ons:**

1. Run *VR-ForcesVR-EngageAdd-ons.exe*. If the add-on installer cannot find the VR-Forces directory, it displays a message. (If you installed VR-Forces on a different computer than the one on which you installed VR-Engage, copy *VR-ForcesVR-EngageAdd-ons.exe* to the computer that has VR-Forces and run it there.)
2. You are prompted to specify the VR-Forces directory to install into (Figure 41). Specify the VR-Forces directory.

Figure 41. VR-Forces VR-Engage Add-ons Wizard



3. Click Next.
4. Complete the installation wizard.

5.2. Setting Up the License Manager

To use a MAK product, you must install the MAK License Manager and get a license for your product. Before you can use a MAK product, you must obtain a valid license file and specify the license server.

➤ To install the MAK License Manager, run the installer.

The general procedure for configuring license management is as follows:

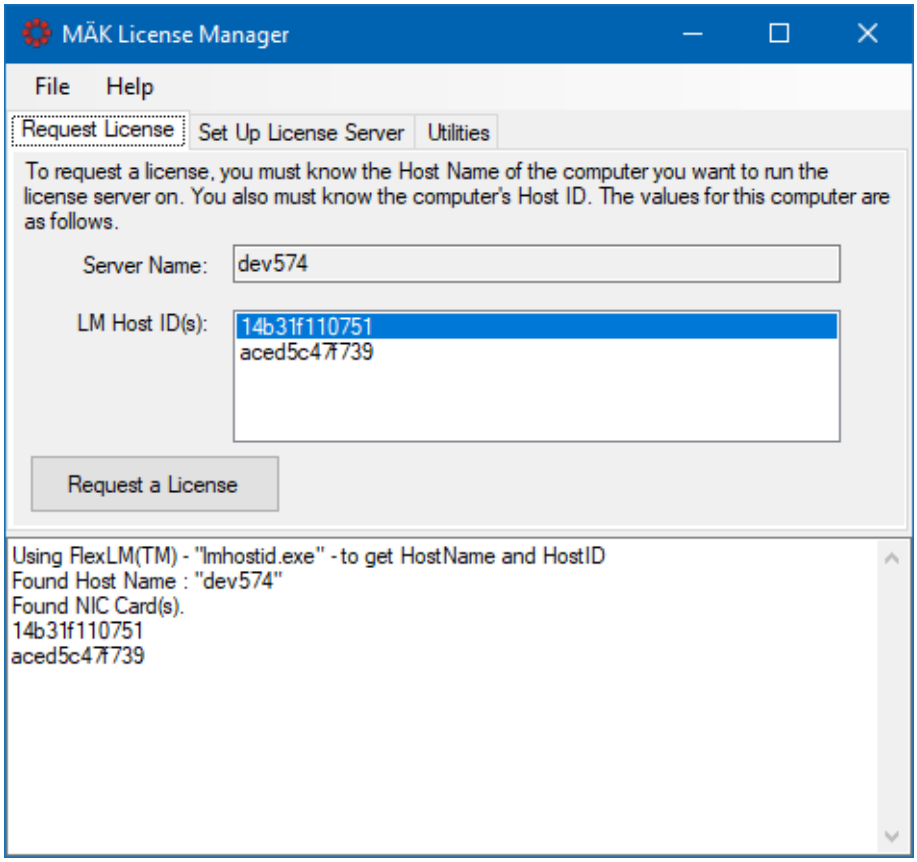
1. Identify the name and ID of the license server and request a license file.
2. Put the license file in the *MAK/MAKLicenseManager* directory on the license server.
3. Run the license server.
4. Specify the license server location.

5.2.1 Identify the Host ID and License Server Name

For simplicity, use the computer on which you installed VR-Engage as the license server. To find out the host ID and license server name:

1. On the Start menu, choose **MAK Technologies > MAK License Manager**. The MAK License Manager utility opens (Figure 42).

Figure 42. License Manager



2. Select the Request License tab. It displays the server name and the IDs for your network cards.
3. If you have more than one network card, select the one that you want to use as Host ID.
4. Send the host ID and hostname to your MAK salesperson. MAK will e-mail you a license file.

5.2.2 Put the License File in the *MAKLicenseManager* Directory

When you receive your license file, put it in the *MAKLicenseManager* directory on the license server. The file should have the extension *.lic*. If it does not, please contact keys@mak.com to clarify why it did not follow this convention.

5.2.3 Run the License Server

➤ To start the license server daemon, on the server machine only, execute **runLm** from the *MAKLicenseManager* directory.

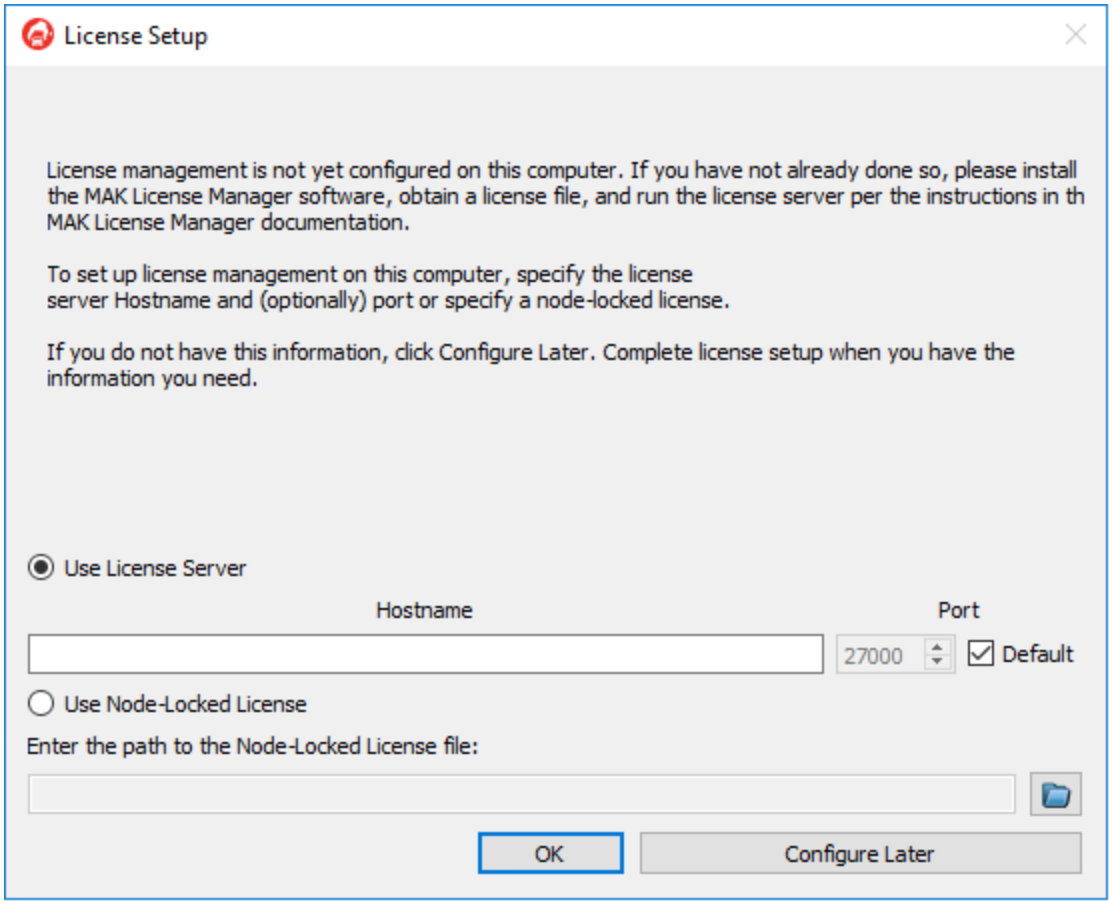
Shutting Down the License Server

➤ To force all applications to check in their licenses and shut down the license server daemon, run **lmdown**.

5.2.4 Specify the License Server

The first time you run a MAK application on a computer, the License Setup dialog box opens (Figure 43). It prompts you to enter the hostname of the license server and optionally, a port number.

Figure 43. License Setup dialog box



1. Type the hostname in the Hostname box.
2. Click Add License Server. The application starts.



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