



VR-Forces 4.8 Release Notes

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Systems Supported

This section describes platform support and system requirements for VR-Forces. To take full advantage of VR-Forces's visualization capabilities and optimize performance, you must use a modern game computer with a high quality NVidia graphics card.

For the most up-to-date information about systems supported, see the Product Versions page on the MAK web site at: <https://www.mak.com/support/product-versions>. For hardware requirements, see <https://www.mak.com/support/hardware-recommendations>.

VR-Forces 4.8 is available for the platforms listed in Table 1. For toolkit users, application code must be built with the indicated compilers in order to link to VR-Forces libraries.

Table 1: Platforms supported

Operating System	Compiler
Windows 10	Microsoft Visual C + + 15.0 (64-bit)
Red Hat Enterprise Linux 8.0 (64-bit libraries)	default compiler

3D Video Cards Supported

VR-Forces 4.8 supports NVIDIA graphics cards that support OpenGL 4.5 VR-Forces does not support AMD (formerly ATI) graphics hardware.

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VR-Forces strives to provide the best 3D scene quality possible and cutting edge visualization effects. To provide this functionality, VR-Forces takes advantage of OpenGL features that may not be supported on older video cards. When this is the case, you can disable these features, allowing VR-Forces to run in 3D modes.

OpenGL 4.5 is the minimum requirement for rendering a 3D scene in VR-Forces. For the best visual quality and highest performance you should use the most recent NVIDIA GeForce card. The minimum recommended card is the 9xx series.

Some laptops have an NVIDIA graphics card and an Intel graphics card. You must configure your computer to use the NVIDIA card. To do so:

1. Open the NVIDIA Control Panel (in the System Tray).
2. Select Manage 3D Settings.
3. Select Global Settings.
4. Select Preferred Graphics Processor.
5. Select High-performance NVIDIA Processor.



You should always try to use the latest drivers available for your video board.

Using Kepler Series Quadro Cards

There is a known issue with the Quadro drivers on Kepler series Quadro cards. NVIDIA says its related to the fact that the default profile optimizes for a fixed eyepoint (for applications like CAD). To run on these cards, you must change the global profile for the driver, as follows:

1. Open the NVIDIA Control Panel.
2. Select the Manage 3D Settings page.
3. Select the Global Settings tab.
4. In the list of driver profiles, select Workstation App - Dynamic Streaming.

We are working with NVIDIA to have their drivers recognize our applications and apply this profile automatically. In the meantime, for Kepler series Quadro you must make this change manually.

Disk Space Requirements

A full installation of VR-Forces requires approximately 15 GB of disk space.

Compiler Compatibility on Windows

MAK provides versions of product releases that have been compiled with different versions of Microsoft Visual C++ (for example, 12.0, and 15.0). When you run MAK products together on the same computer, for example, VR-Forces and VR-Vantage Stealth, we strongly recommend that you run versions compiled with the same compiler. Mixing products compiled with different versions of the compiler can result in program instability.

Required Software for Toolkit Users

If you plan to build VR-Forces applications using the VR-Forces Toolkit, you must download and install VR-Link 5.5.

If you plan to build the VR-Forces GUI, you must download and install Qt 5.10.1 (Windows) or 5.14.0 (Linux). You can download it at:
<http://www.mak.com/support/bonus-material>.

Qt is also available as a free download under the LGPL version 2.1 license at <https://www.qt.io>. This version should be satisfactory for most VR-Forces customers. If you need a Qt commercial license, you must purchase the license from Qt.

MAK Product Compatibility

To build VR-Forces applications, you must link with VR-Link 5.5. If you are building for HLA and want to link with the MAK RTI, use MAK RTI 3.x or later, although we recommend use of the latest release. If you are building for HLA Evolved, you must use MAK RTI 4.0.4 or later.

License Manager

VR-Forces 4.8 uses FLEXlm 11.13.0.2.

The License Manager files are not part of the VR-Forces installer. You can download them at:

- ♦ Windows: <http://ftp.mak.com/out/MAKLicenseManager-win64-setup.exe>
- ♦ Linux: <http://ftp.mak.com/out/MAKLicenseManager-linux64-setup.tar.gz>

A license manager FAQ is available at:

<http://www.mak.com/license-support.html>

Third-Party Libraries Supported

VR-Forces 4.8 uses the indicated versions of the following libraries:

- ♦ VR-Link 5.5
- ♦ Qt 5.10.1 (VC 15), Qt 5.14.0 (Red Hat 8)
- ♦ OpenSceneGraph 3.4.0
- ♦ Boost 1.63.0
- ♦ FreeGlut 2.4.0 (Windows), 2.6.0 (Linux)
- ♦ GL-Studio 5.1.2 (VC 15)
- ♦ DI-Guy 13.4 (development version)
- ♦ Triton 3.73
- ♦ Silverlining 5.64
- ♦ SpeedTree 6.3.2
- ♦ CDB API 2.2 (Windows), 2.1 (Linux)
- ♦ osgEarth 3.0
- ♦ CUDA 9.2 (Windows), 10.2 (Linux)

Using MAK Products on Virtual Machines

You can run MAK products on virtual machines. For more information, see the Cloud & Virtualization page on our website at <https://www.mak.com/learn/cloud-virtualization>.

Network Compatibility

VR-Forces 4.8 is compliant with RPR FOM 1.0 and RPR FOM 2.0 and includes FOM mappers for many draft versions of the RPR FOM. It is compliant with RTIs that support the HLA 1.3 specification, the SISO DLC HLA API 1516 version of the IEEE 1516 specification (SISO-STD-004.1-2004), or HLA Evolved.

To use an RTI with VR-Forces it must use the same operating system and be built with the same compiler.

VR-Forces 4.8 supports DIS 4, 5, 6, and 7, and can therefore interoperate with DIS applications of any of these versions.

Backwards Compatibility

The VR-Forces 4.8 APIs are not compatible with VR-Forces 3.x or earlier. It is largely compatible with the 4.3.x API and later. Small changes may be necessary to migrate from 4.5.

Scenarios created with recent releases are usually forward compatible. However, changes to tasks, systems, and terrain reasoning may change how simulation objects behave.

Support for MAK Data Logger Recordings

The recordings provided with MAK Data Logger 5.4 or later use the new FED file naming conventions (described in *MAK Products Interoperability Guide*). These should work seamlessly with the default HLA configurations in VR-Forces 4.8. If you want to connect VR-Forces 4.8 to recordings made with previous versions of the Logger, you must change the connection configuration to use the old FOM naming convention.

RPR FOM Versions Supported

VR-Forces 4.8 has built-in support for versions 1.0 and 2.0 (drafts 6, 17, and 20) of the RPR FOM and RPR FOM 2.0, draft 17 with DI-Guy extensions. It also supports VR-Link's ability to support alternative FOMs through the FOM Mapper. By default, VR-Forces 4.8 uses RPR FOM 2.0.

If you are building an application with the VR-Forces toolkit and you want to specify a version of the RPR FOM through code, pass the version number (for example, 2.0006) to the *DtFedAmbWrapper* constructor and pass the resulting object to the *DtExerciseConn* constructor. Also, make sure you are using a federation execution name that corresponds to the right FED file. For example:

```
DtExerciseConn conn("VR-Link20006", "MyApp", new DtRprFomMapper(2.0006));
```

In order to support RPR FOM 1.0, we have added the following extensions (which are supported in later versions of the RPR FOM):

- ♦ EnvironmentProcess
- ♦ GriddedData
- ♦ EmbeddedSystem.IFF
- ♦ EmbeddedSystem.IFF.NatoIFF
- ♦ EmbeddedSystem.IFF.NatoIFF.NatoIFFTransponder
- ♦ EmbeddedSystem.IFF.NatoIFF.NatoIFFInterrogator
- ♦ EmbeddedSystem.IFF.SovietIFF
- ♦ EmbeddedSystem.IFF.SovietIFF.SovietIFFTransponder
- ♦ EmbeddedSystem.IFF.SovietIFF.SovietIFFInterrogator
- ♦ EmbeddedSystem.IFF.RRB
- ♦ BaseEntity.AggregateEntity
- ♦ ObjectRoot.BaseEntity.PhysicalEntity.Lifeform

For both RPR FOM 1.0 and 2.0 VR-Forces 4.8 relies on the Controlling and ViewControl custom MAK extensions.

New Features and Updates

VR-Forces 4.8 has the following new features and updates.

Improved Modeling

- ♦ The Visual Model Editors dialog box has multiple improvements and additions. Now you can:
 - See the saved file location for element and model definitions, as well as type mappings, for easier access and export.
 - Use options to save all definitions at once.
 - Change a definition’s file location using a drop-down list.
 - Filter definitions by their file location.
 - Copy visual definitions from one definition and paste them in another.

The entity type mapping filtration system has also been fixed, in addition to the file location filter.

For more about this dialog box, see Section III, *Visual Models in MAK Applications*, in *Adding Content to MAK Applications Reference Manual*.

- ♦ DI-Guy Character Viewer is now included with the tools that are part of the VR-Vantage installation. See Section IV, *DI-Guy*, in *Adding Content to MAK Applications Reference Manual*.
- ♦ The default configuration for vehicles moving along roads is now configured for six types of roads with different path costs instead of three.
- ♦ When human entities change postures, start moving, or stop moving, the visuals are now more smooth and realistic.

- ♦ The new Fuel Tanker Trailer is articulated, with a pivot point where the tractor trailer attaches to the semi truck. This is a single entity, not two entities joined together. The actuator that allows for this can be used on other models designed to articulate in this way by configuring the entities and *.sysdef* files.
- ♦ Articulated parts. You can now manage simulation object's articulated parts using the Simulation Object Editor (SOE). For examples, see Section 63.3, [“Editing a Model's Articulated Parts,”](#) in *VR-Forces Users Guide*.

In addition to updating your SMS to 4.8, you must update your *.entity*, *.sysdef* and *.ope* files. Please see the *VR-Forces Migration Guide* for instructions.

Simulation Objects

- ♦ Entities now support more nuanced visual markings. For examples, please see Section 34.47, [“Markings,”](#) and Section 62.2.8, [“Specifying Visual Markings,”](#) in *VR-Forces Users Guide*.
- ♦ Update to SISO enumerations. Current enumerations have been updated to SISO-REF-010 v25.
- ♦ MAK enumerations for entities. The Change Object Type dialog box in the SOE now shows details instead of simply “custom” for MAK-specific features). It also includes a search feature, allowing users to search the SISO and MAK-specific enumerations by description.
- ♦ 2D icon colors and transparency. During a session, you can change the color and transparency of 2D icons. This is useful for users that only care about some of the simulation objects and want to configure the icons' appearance to focus on the simulation objects that they are working with. The customizations are visible only in the VR-Forces GUI where they were set, and not saved with the scenario. For details, see Section 16.4, [“Customizing 2D Icon Colors,”](#) in *VR-Forces Users Guide*.
- ♦ Mideast crowds. There are three new crowd unit types: Civilian Mideast Crowd (Small), Civilian Mideast Crowd (Medium), and Civilian Mideast Crowd (Large). This allows you to create crowd units of middle eastern civilians without editing the *.sysdef* file. See Section 19.2.1, [“Creating Crowd Units,”](#) to learn more about crowd units.
- ♦ Animal herds. There are new units and areas that allow you to create herds of cows, goats, and sheep. Please see Section 19.2.2, [“Creating Herd Units,”](#) and Section 19.3.2, [“Creating Animal Herds Using Areas,”](#) for details.
- ♦ Added fixed array and sized string property encodings to support additional encodings from HLA for the NETN FOM.
- ♦ When configuring embarkation, you can now specify that entities turn to a new orientation rather than snapping to it.
- ♦ The M2A2 Bradley IFV, M2A3 Bradley IFV, and M3A2 Bradley CFV have been improved:
 - They now have a functioning coaxial machine gun. If there are no targets for the main gun, the entity is free to traverse the turret to aim the coaxial gun.

- They now also have a TOW missile launcher that traverses with the turret. By default, it has two missiles ready to fire and five additional missiles carried in the vehicle that are available to reload the launcher.
- There is now a task for engaging a target with the TOW missiles; see Section 27.10, “[Fire TOW At Target](#),” in *VR-Forces Users Guide*. By default, the TOW only targets tank-type vehicles. Other vehicles are targeted by the 25mm gun.
- ♦ The new Firing Position tactical graphics are engineering point objects in the Entity Level SMS with additional state properties described in *Fighting_Position_Point.ope*, including:
 - HeightDynamic, the height of the protective berm above the ground.
 - LengthDynamic, the overall length of the fighting position.
 - LengthDefilade, the length of the defilade portion of the fighting position.
 - WidthDynamic, the width of the fighting position.
 - Depth, the portion of the fighting position below ground at its deepest point.
 - DepthTurret, the portion of the fighting position below ground at the depth that provides cover for the turret of a vehicle.
 - DepthHull, the portion of the fighting position below the ground at the depth that provides cover for the hull but not the turret of a vehicle.
 - Heading, the cardinal direction in which the front of the fighting position faces.
- ♦ The new simulation object MiddleEastern Small Village places buildings, people, and animals to simulate a village.
- ♦ The State Data in the Information dialog for aircraft now displays True Airspeed and Indicated Airspeed, which are measured in knots, and Mach. (The Speed is the ground speed.) The Last Selected Object panel displays the True Airspeed (TAS).

Tactical Graphics

- ♦ Minefield areas. There are new areas that allow you to create a minefield in entity-level scenarios. See Section 40.4, “[Creating and Editing a Minefield Area](#),” in *VR-Forces Users Guide*.
- ♦ Air traffic areas. New; generate air traffic based on flight plans in the `./data/flightPlans` directory. Air traffic areas rely on procedural airports. See Section 18.8.3, “[Creating an Air Traffic Area](#),” in *VR-Forces Users Guide*.
- ♦ Bullseye graphic. The new bullseye graphic allows you to measure the distance between a simulation object or the cursor and the point in the terrain where you placed the bullseye. You can create multiple bullseyes for each force using the Tactical Graphics palette. You can also edit bullseyes, giving them any name you want. You use the Bullseye Selection Toolbar to choose the bullseye from which to measure. For more details, please see Section 40.7, “[Creating and Using Bullseyes](#),” in *VR-Forces Users Guide*.

- ♦ Arcs, sector areas, and spider webs. These are new graphics that do not interact with simulation objects. Use the circle procedure to draw a spider web. See Section 40.1.3, [“Drawing Circles and Ellipses,”](#) Section 40.1.4, [“Drawing Arcs,”](#) and Section 40.1.5, [“Drawing Sector Areas,”](#) in *VR-Forces Users Guide*.
- ♦ Changes to overlays. Tactical graphics and simulation objects that are not visible on the map appear in the Objects List in gray. Tactical graphics and simulation objects can now be on more than one overlay; as a result, overlays now have a mixed state to show that some items in the overlay are visible and others are not. See Section 39.1, [“Creating and Editing Overlays,”](#) in *VR-Forces Users Guide*.

Task Visualizations and Range Lines

- ♦ Estimated time of arrival. Fixed and rotary wing aircraft have a new task visualization which shows the approximate time when they will reach a destination, according to the simulation clock. This is either the end of a route or a waypoint, and displays only when the entity is selected. To learn about viewing task visualizations, please see Section 43.6, [“Visualizing Tasks,”](#) in *VR-Forces Users Guide*.
- ♦ Range lines. You can create a range line between two points, each of which can be a simulation object or a point on the terrain. The range line displays the distance between the two end points and also the compass bearing from the start point to the end point. To learn how to create and use range lines, see Section 48.11, [“Range Lines”](#).

Navigation

- ♦ To improve performance, navigation areas now support only one platform. Existing navigation areas that have multiple platforms defined for the navigation profile are supported for backward compatibility, but we recommend that you edit them so that they use only one and create separate navigation areas for each platform. For details, please see Section 59.2.2, [“Creating a Navigation Area,”](#) in *VR-Forces Users Guide*.
- ♦ Military ladders (introduced in IPB2) are now part of the navigation. Human entities can plan a path that includes climbing the ladders as the entities move around the terrain.
- ♦ Cover points are now placed closer to the edges of features that offer cover. For small features (less than 2 times the entity’s radius), only a single point of cover is placed. Generation of cover points is also faster.
- ♦ Customizable navigation preferences. You can design new navigation preferences that can be assigned through **Set** → **Action** → **Navigation Preferences**.

Tasks, Sets, and Commands

- ♦ New and changed tasks:
 - Airdrop, Airdrop Along Route, and Airdrop from Aircraft. The Air Drop task for aircraft has been replaced by two new tasks: Airdrop and Airdrop Along Route. Those tasks do not specify the entities that will perform the airdrop. Instead, embarked entities have the Airdrop from Aircraft task, which allows them to perform tasks after they land on the terrain. For more information, please see Section 26.1, “[Airdrop Along Route](#),” Section 29.1.5, “[Airdrop](#),” and Section 29.1.6, “[Airdrop from Aircraft](#),” in *VR-Forces Users Guide*.
 - There are new movement tasks for fixed- and rotary-wing entities, which are Fly Loiter Pattern and three Search and Rescue patterns: Fly Creeping Line Pattern, Fly Expanding Square Pattern, and Fly Parallel Pattern. To learn about these (and other movement tasks), please see Chapter 26, *[Movement Tasks for Entity-Level Scenarios](#)*, in *VR-Forces Users Guide*.
 - Orbit, Fly Loiter Pattern, Search and Rescue. Rotary-wing aircraft can now perform these movement tasks. See Chapter 26, *[Movement Tasks for Entity-Level Scenarios](#)*.
 - Generate Air Traffic from Flight Plans has been improved to include optional IFF support and realistic flight IDs. See Section 18.8.4, “[Creating a Global Plan to Generate Air Traffic](#),” in *VR-Forces Users Guide*.
 - A new Move Along Route with Actions task lets you assign actions to an entity to perform as it follows a route. For example, you can task an aircraft with following a route to a target point and dropping a bomb. See Section 26.16, “[Move Along Route with Actions](#),” in *VR-Forces Users Guide*.
 - Move to Waypoint. When assigning this task to a simulation object as part of a plan, you can specify that they should continue on. They move through the waypoint and on to the next part of the plan without stopping at the waypoint. This feature is available for both entity- and aggregate-level scenarios. For more about this movement task, please see Section 26.23, “[Move to Waypoint](#)”.
 - Fast Rope Insertion. This existed in previous versions of VR-Forces, but as a movement task. It is now an embarkation task, covered in Section 29.1.7, “[Fast Rope Insertion](#)”.
 - Fire Team Bound to Location. You can task a fire team to move to a destination while defending against a threat in a specified location. Please see Section 28.19, “[Fire Team Bound to Location](#),” for details.
 - Fire Team and Squad Travel to Waypoint. These tasks allow you to move a fire team or squad to a waypoint in a particular formation. For details, see Section 28.21, “[Fire Team Travel to Waypoint](#),” and Section 28.31, “[Squad Travel to Waypoint](#)”.
 - Fire Team Occupy Fire Position. This movement task causes the members of a fire team to find firing positions. Please see Section 28.20, “[Fire Team Occupy Fire Position](#)”.

- Fire Team Suppress Target. This task is similar to the Provide Suppressive Fire from Cover task, but it works for an entire fire team instead of an individual. Please see Section 27.13, [“Fire Team Suppress Target”](#).
- Provide Suppressive Fire From Cover. This engagement task replaces the Provide Suppressive Fire task. It is essentially the same, but if the entity must stand or move to the side to see the target, it will do so. It is useful after the entity has executed a Find Cover task. Please see Section 27.24, [“Provide Suppressive Fire at Object”](#).
- Rush to Location. This movement task makes an entity move quickly to a specified location and then assume a prone position or kneeling position. Please see Section 28.30, [“Rush to Location”](#).
- A tear gas grenade is now available for entities to throw. For information on using grenades, see Section 27.27, [“Throw Grenade Tasks”](#).
- Crowd Around Waypoints. Crowds can be tasked to gather around a waypoint and perform a behavior for a specified period of time. This is designed to be part of a plan. For details, see Section 28.12, [“Crowd Around Waypoints,”](#) in *VR-Forces Users Guide*. To explore this and other crowd tasks, try the new CrowdBehaviors scenario.
- Riot. Crowds can be tasked to riot around riot points in an area. Optionally, they can set fires at the riot points. Please see Section 28.29, [“Riot”](#). To explore this and other crowd tasks, use the new CrowdBehaviors scenario.
- Flee From Threats reactive task. The former Flee From Entity Types and Flee From Explosions reactive tasks have been combined into the new Flee From Threats reactive task. This task also includes new, additional fleeing behaviors: entities will flee from the source of gunfire and any entities killed nearby. There is also a Flee From Fire Events behavior that is disabled by default. To learn about this and other reactive tasks, please see Section 29.11, [“Reactive Tasks,”](#) in *VR-Forces Users Guide*.
- Rope Suspension Extraction, Extract Using Rope, and Rope Suspension Insertion. These tasks work together to simulate a team of personnel embarking on a rope attached to a helicopter and riding it to another location, where they disembark. Rope Extraction and Rope Suspension Insertion are embarkation tasks for helicopters, while Extract Using Rope is an embarkation task for humans. For details, please see Section 29.1.8, [“Rope Suspension Extraction,”](#) Section 29.1.9, [“Extract Using Rope,”](#) and Section 29.1.10, [“Rope Suspension Insertion”](#).
- Ladder Extraction, Extract Using Ladder, Ladder Insertion, and Insert Using Ladder. These tasks allow you to simulate a team of personnel embarking on or disembarking from a helicopter using a ladder. By default, the ladder is attached to the passenger door at the front left of the vehicle, but the task supports use of the rear cargo door and you can edit the entity in the SOE to place the ladder at the cargo door instead. For details, see Section 29.1.11, [“Ladder Extraction,”](#) Section 29.1.12, [“Extract Using Ladder,”](#) Section 29.1.13, [“Ladder Insertion,”](#) and Section 29.1.14, [“Insert Using Ladder”](#).

- Squad Dismount. You can task a squad to exit a helicopter or ground vehicle and assume a formation around it. For details, see Section 29.1.15, [“Dismount”](#).
- ♦ New sets:
 - Emergency Beacon. This set data request is part of the Search and Rescue feature set (see below). It turns an emergency transponder on or off; see Section 34.25, [“Emergency Beacon,”](#) in *VR-Forces Users Guide*. Entities with the Search and Rescue Sensor can detect the transponder.

By default, the emergency transponder is available on the US Air Force human entity, but you can add it to other entities using the SOE.
 - Loadout. This is currently available on the F/A-18 Hornet as an example of how to change the types of missiles that the entity has loaded. See Section 34.44, [“Loadout,”](#) for information about using this set data request.
 - Navigation Priority. Entities now have a navigation priority. By default, crowds are set to low and all other entities are set to high. Higher priority entities have more path planning time than lower level entities, allowing them to be move more effectively. You can change the priority for an entity using this new set data request. See Section 34.50, [“Navigation Priority”](#).
 - You can now set human entities, such as members of a crowd, to clamp to the ground in a way that improves performance. By default, crowds use low fidelity. See Section 34.33, [“Group Clamp Fidelity,”](#) in *VR-Forces Users Guide*.
 - Articulated Part. On simulation objects with articulated parts that are not handled by another controller, you can set the articulation of the parts at runtime. For details, please see Section 34.9, [“Articulated Part,”](#) in *VR-Forces Users Guide*.
 - Add to Target Priority List and Clear Target Priority List. You can assign a list of simulation objects for an entity to target, and specify the priority of each target. For details, see Section 34.3, [“Add to Target Priority List,”](#) and Section 34.14, [“Clear Target Priority List”](#).
 - Pitch. Military ladders are new cultural features available in this release of VR-Forces. They allow you to set the pitch, as described in Section 14.6, [“Specifying an Object’s Pitch Dynamically,”](#) and Section 34.54, [“Pitch”](#).

You can also use the SOE to edit other simulation objects and allow users to set their pitch; see Section 63.1.9, [“Specifying Entity Properties that Can Be Edited in the Front-End,”](#) for details.
 - Freeze Fuel Levels and Freeze Munition Levels. You can set an entity to stop using fuel or munitions (including countermeasures). They continue to behave as normal; their resources are simply no longer depleted. For details, see Section 34.30, [“Freeze Fuel Levels,”](#) and Section 34.32, [“Freeze Munition Levels”](#).
 - Freeze Movement. Freeze the spatial movement of individual entities and entities that have been aggregated as a unit. For details, please see Section 34.31, [“Freeze Movement,”](#) in *VR-Forces Users Guide*.

- Skill Level. Acts as a modifier on the probability that the entity will hit the target it is shooting at. For details, see Section 34.69, “[Skill Level](#)”.
- Subsystems Enabled. Enable or disable one or more of a simulation object’s systems, such as weapons or sensors. The UI feature for Sensors Enabled is no longer available because you can manage sensors with the new feature (the API code is still supported). For details, see Section 34.73, “[Subsystem Enabled](#)”.
- ♦ New commands:
 - Create Sensor View: Simulation objects with gimbaled sensors can create a sensor view while executing a plan. For details, please see Section 37.7.8, “[Creating a Sensor View from a Plan](#),” in *VR-Forces Users Guide*.
 - Test Result: As part of a plan, send a message to the console to indicate that the result is a success, failure, or no status. For details, see Section 37.7.9, “[Sending Test Results](#)”.
- ♦ There are new entity-level Lua tasks that allow members of a unit to follow the leader along a route:
 - `follow_along_offset_route` has the members of the unit follow the leader’s route at an offset. The receiver of this task generates its own offset route based on the offset provided.
 - `unit_travel_offset_routes` tasks a unit to travel a route. The first subordinate travels the route. The remaining subordinates follow the leader along offset routes. The offsets are calculated for each subordinate based on their positions relative to the leader at the time the task is assigned.
- ♦ You can now access the Script Settings page from the Scripts menu in the Scripts dialog box.

Search and Rescue

- ♦ Emergency Transponder. This is a beacon that alerts entities with the Search and Rescue Sensor to detect the entity it is attached to. The US Air Force human entity includes this as part of its additional systems. This is controlled by the new Emergency Beacon set data request; see Section 34.25, “[Emergency Beacon](#),” in *VR-Forces Users Guide*.
- ♦ Search and Rescue Sensor. This new sensor system is part of the Search and Rescue feature set (see below) and allows an equipped entity to detect the Emergency Transponder. When the transponder is on (using the Emergency Beacon set data request), the sensor can detect the entity at a greater distance than when it is off. Detection is limited by the sensor’s maximum range.

The SH-60 Seahawk rotary-wing entity now includes this sensor system, and you can add it to other entities using the SOE.

- ♦ Human floating in water. By default, the US Air Force entity is the only human entity that will float when placed in water. You can edit other entities using the Visual Model Editors to allow them to bob up and down on the waves:
 - In the Model Definition editor, set the `waterlineOffset` (-1.55 is approximately correct for adult males).
 - In the Entity Definition editor's Kinematic State definition, set `possible-groundclampingmode` to `ClampWater` and then add `isAmphibious` set it to `True`.

To learn how to edit entity definitions, please see Section 14.7, “[Editing a Model Definition](#),” and Section 15.6, “[Editing an Element Definition](#),” in *Adding Content to MAK Applications Reference Manual*.

New and Updated Systems

- ♦ Tactical smoke. There are new configuration parameters for the tactical smoke system that gives you more control over how smoke moves and dissipates based on wind. These parameters affect the simulation only; they are not reflected in the visuals of the GUI.
- ♦ Harpoon Missile Launcher. This is a new weapon system that can fire Harpoon missiles. The F/A-18 includes this weapon system, but it defaults to zero missiles loaded as part of the new loadouts feature, described below.
- ♦ Loadouts and weapon configuration:
 - For missile launcher weapon systems, the SOE now allows you to define a default number of missiles as well as a maximum number. The Default Number of Missiles is the number that are loaded on the entity when it is first placed. The Maximum Number of Missiles is the maximum allowed for the entity.

If you use the Restore set data request on an entity, its ammunition is set to the default amount, not the maximum.

While there are defaults for the entities, as defined in the Simulation Model Set, you can change those values at runtime. One method is to use a script. The F/A-18 Hornet includes an example of a script, the Loadouts set data request. For details, please see Section 34.44, “[Loadout](#),” in *VR-Forces Users Guide*.

- Missile systems have been improved to handle cases where multiple systems can engage the same target. If an entity has multiple missile systems and one of those systems has a missile on its way towards a target, any other missile systems on the entity will focus on other targets (unless explicitly tasked to focus fire on the target). When the missile detonates or misses, the target will be considered again for targeting if it was not destroyed.
- When a system has no ammunition, it does not take responsibility for a target. Other systems that have ammunition can take the opportunity to fire on the target.

- ♦ The new `hit-own-force` setting in weapon `.sysdef` files that use the ballistic gun actuator allows you to control whether a ballistic weapon will hit members of the shooter's force. The default value is true, allowing for friendly fire. You can set it to false and then any line-of-sight checks will ignore entities of the same force as the shooter, causing the bullet to pass harmlessly through them.
- ♦ Emergency Transponder and Search and Rescue Sensor. These systems are part of the new search and rescue feature set described in Section 26.37, "[Search and Rescue](#)," in *VR-Forces Users Guide*.

MAK Radio

- ♦ The new MAK Radio feature supports voice communications over radios and intercoms. For details, please see Chapter 51, [MAK Radio](#), in *VR-Forces Users Guide*.
- ♦ The MAK Radio allows for more complex settings for the radios and intercoms. As part of this, the modulation and cryptographic settings are as defined for the Transmitter PDU in the IEEE DIS standard, IEEE Std 1278.1-2012. For details, see Section 51.4, "[Configuring the MAK Radio](#)," in *VR-Forces Users Guide*.

Scenarios

- ♦ After loading a scenario, the next time you open the Load Scenario dialog box, it defaults to the directory you used before.
- ♦ The MSDL file has been improved to support scenario definition for LVCIA and JLCCTC.
 - Forces now have associations to all other Forces (friendly, neutral, or hostile). Any force with the word "neutral" is considered neutral, and all other forces are considered neutral to it unless specifically marked as hostile in the hostility matrix. Other forces not marked as hostile to one another are considered friendly.
 - Forces include the country code. Please note that, while country codes are now included, only USA, RUS, GBR, and AFG currently use the correct three-letter code. In other cases, a two-letter code is exported (which is not compliant with the MSDL schema).
 - The area of interest bound box id correctly computed.
 - The Unit ForceRelationChoice is now UNIT or FORCE_SIDE, not the name of a side.
 - Force units (top level) are not exported to the MSDL. Units and objects that have them as superior have a relation to a ForceSide instead.

To learn more about importing and exporting MSDL files, see Section 7.2.2, "[Importing and Exporting MSDL](#)," in *VR-Forces Users Guide*.

Terrain

- VR-Forces now uses osgEarth 3.0.
- You can control airport runway lights manually from the new Airport Settings Panel, or as part of a global or individual plan. To learn about these features, please see Chapter 60, [Airports](#), in *VR-Forces Users Guide*.
- VR-Forces now has a tool that helps you debug problems in the simulation terrain. To learn how to use the Simulation Terrain Debugging Tool, see Section 10.13, [“Debugging the VR-Forces Simulation Terrain,”](#) in *Adding Content to MAK Applications Reference Manual*.
- The separate cache tool for generating streaming terrain cache data has been replaced by functionality found in the VR-Vantage application. To learn how to use this feature, see Section 10.1.2, [“Caching earth File Terrain Data,”](#) in *Adding Content to MAK Applications Reference Manual*.
- Earth files have a new <ThreeDTiles> element that supports streaming 3D tiles. For an example, examine the file `./userData/servers/Test-3DTiles.earth`.
- The speedtree_catalog attribute’s features element has been replaced by the ogrfeatures element. See Section 5.2.4, [“Configuring the GeoTypical \(GT\) Dataset \(101\),”](#) in *Adding Content to MAK Applications Reference Manual* for an updated example.
- VR-Forces supports procedural trees by setting `vrfsim:enabled` to true in the GroundCover element in an earth file. For details, please see Section 3.10.2, [“Configuring Procedural Trees for VR-Forces,”](#) in *Adding Content to MAK Applications Reference Manual*.
- The terrain is automatically redrawn to show craters when VR-Forces receives the appropriate update message (such as from a detonation). See Section 7.6, [“Craters,”](#) in *Adding Content to MAK Applications Reference Manual*.
- The back-end can now get land use data from streaming raster data.
- The system now uses land use data to determine whether there should be dust, snow, or water spray when a rotary-wing entity is over terrain that would be disturbed by rotor wash (Figure 1).

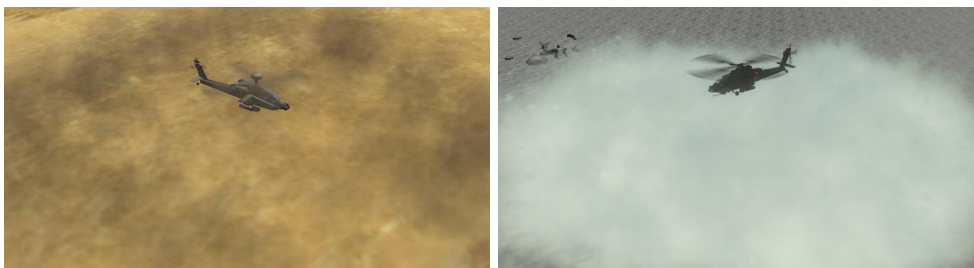


Figure 1. Rotor wash

- You can move the observer to a particular address or set of coordinates. See Section 53.13, [“Using the Go To Location Panel,”](#) in *VR-Forces Users Guide*.

Weather

- ♦ The Environment Conditions page of Scene Settings now includes a setting for rain accumulation. To learn about the rain setting, please see Section 11.4.5, “[Setting Rain Accumulation](#),” in *VR-Forces Users Guide*.
- ♦ Masking features enable you to define whether puddles will accumulate in areas. For details, please see Section 10.4, “[Using Shader-based Effect Maps](#),” in *Adding Content to MAK Applications Reference Manual*.
- ♦ Rain effects on the ground and puddles are now supported. The terrain appears slightly shinier and specular. The puddles are also specular and, if there is rain in the scene, there are ripples in the puddles ([Figure 2](#)).



Figure 2. Rain puddles

- ♦ Hail is now available as a type of precipitation. For details, see Section 11.4.4, “[Specifying Precipitation Type and Intensity](#),” in *VR-Forces Users Guide*.
- ♦ The Sandstorm cloud layer has been improved. To learn about using cloud layers, see Section 11.6, “[Creating and Editing Cloud Covers](#),” in *VR-Forces Users Guide*.
- ♦ The Ground Fog cloud layer has been improved. The classes that begin with DtGroundFog were added, along with shader changes and support code. To learn about using cloud layers, see Section 11.6, “[Creating and Editing Cloud Covers](#),” in *VR-Forces Users Guide*.
- ♦ You can change the effects of weather on ground vehicle movement over different surfaces, which now include snow and ice. See Section 13.9, “[Entity Movement and Soil Type](#),” in *VR-Forces Users Guide*.
- ♦ The Weather page of the Environment Conditions dialog box now includes settings for snow. Snow can also be set in a global plan. See Section 11.4.6, “[Setting Snow Depth and Elevation](#),” in *VR-Forces Users Guide* to learn about the snow settings.
- ♦ The new Weather at Location panel displays the weather at the clicked location, making it easier to see the weather conditions at the point in the terrain. See Section 11.7, “[Displaying Weather Conditions at a Location](#),” in *VR-Forces Users Guide*.

Display Settings and Application Settings

- ♦ The options Prompt Before Abandoning Plan and Prompt Before Interrupting Task have moved to the GUI Settings page in Application Settings.
- ♦ Shadows are now bypassed by default on moonless nights for performance. Shadow casting by moonlight is now a configuration setting, and can be disabled for performance reasons, if desired. To learn about adjusting the shadow settings, see Section 45.11, “[Displaying Shadows \(3D Only\)](#),” in *VR-Forces Users Guide*.
- ♦ You can enable and disable wheel rotation.
- ♦ You can specify a distance at which DI-Guy characters stop animating, unless they are changing posture.
- ♦ The Date and Time page of the Environment Conditions dialog box now allows you to specify whether to use a standard or military time and date format. You can also determine the display format for the date and time by choosing one of the formats defined for the format type. For details, please see Section 11.2, “[Setting the Date and Time of Day](#),” in *VR-Forces Users Guide*.
- ♦ The State Data page of the Information dialog box for human entities now includes the current DI Guy Animation and DI Guy Hand Item.
- ♦ You can specify a timeout value for track history segments. For details, see Section 43.2.1, “[Configuring Track History Segments and Timeout](#),” in *VR-Forces Users Guide*.
- ♦ You can change the color of an entity’s track history ribbon ([Figure 3](#)). For details, see Section 43.2.2, “[Coloring an Entity’s Track History](#),” in *VR-Forces Users Guide*.

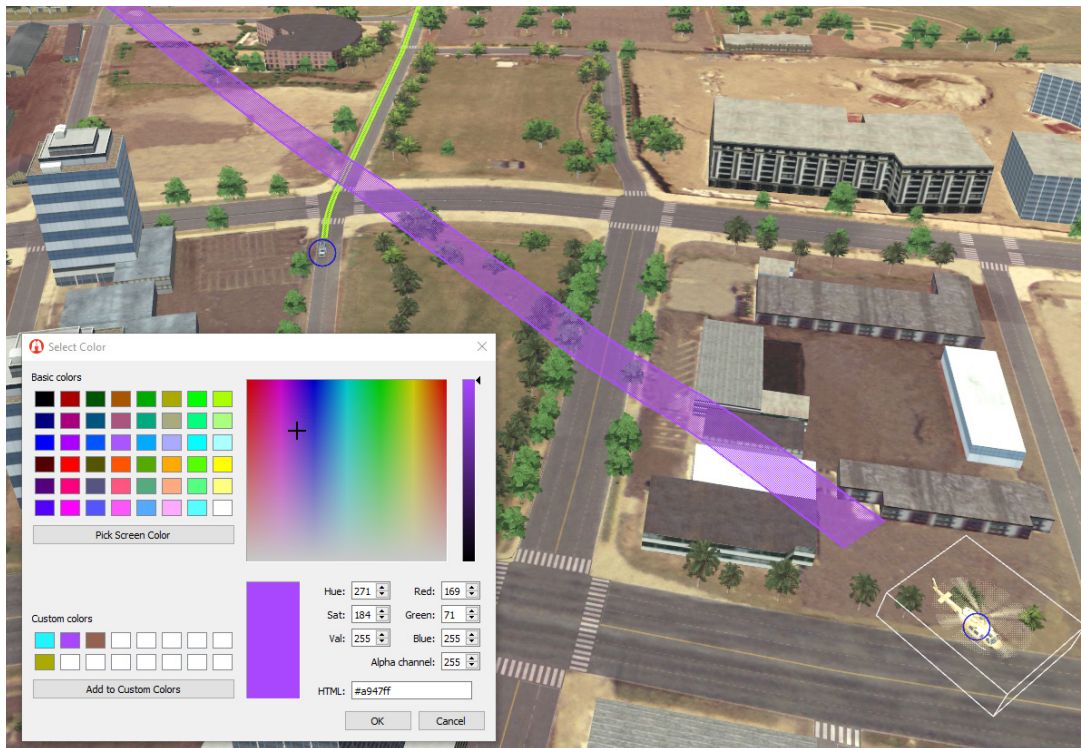


Figure 3. The track histories of a truck (top center in green) and a helicopter (top left to bottom right in purple) with custom colors.

Configuration

- You can change the default installation directory by setting up a `MAK_INSTALL_DIR` environment variable. For details, see [“Default Windows Installation Directory,”](#) under Section 2.1.1, [“Installing the VR-Forces on Windows,”](#) in *VR-Forces Users Guide*.
- On installation, the settings directories are referenced from the application settings directory. There are two new command-line options that allows users to save their settings in their own directory, enabling them to have customized settings in the application, even on shared workstations. See `--useUserSettingsDirectory` and `--sharedSettingsDirectory` in Chapter 5, [Command-line Options](#), in *VR-Forces Users Guide*.
- The new `--appIdRangeMax` command-line option allows you to give a range maximum to roll the application number to the next ID in the range. See Section 5.2, [“Command-Line Options for vrfSim,”](#) in *VR-Forces Users Guide*.
- You can specify the directories where their terrains and scenarios are saved using the new `--userScenarioDirectory` and `--userTerrainDirectory` command-line options. See Section 5.1, [“Command-Line Options for vrfGui,”](#) in *VR-Forces Users Guide*.

- ♦ The new `--noAppDataSpotReportDefs`, `--mergeHierarchySpotReportDef`, and `--mergeLeafSpotReportDef` options allow you to manage the hierarchy and leaf files for spot reports. See Section 5.1, “[Command-Line Options for vrfGui](#),” in *VR-Forces Users Guide*.
- ♦ For Windows only, the new `vrfSim.mtl` parameter “clockMode” is used in absolute time stamping mode only, and allows you to choose between the internal timer (previous behavior) or continual synchronization with the system clock. See Appendix B, *The vrfSim.mtl Configuration File*, in *VR-Forces Users Guide*.

There is now a `--clockMode` command-line option, as well. See Section 5.2, “[Command-Line Options for vrfSim](#),” in *VR-Forces Users Guide*.

Performance

- ♦ The speed of cover point generation during the navigation data generation process is increased, improving performance.
- ♦ The Performance Statistics and Function Profiler Overlays have been combined with an improved user interface. Please see Section 6.4, “[Displaying Performance Statistics](#),” in *VR-Forces Users Guide*.
- ♦ VR-Forces now ships with the Tracy Client, which enables you to collect performance statistics in a file to send to our technical support team for help in tracking down problems. For details, see Section 6.4.4, “[Using the Tracy Client](#),” in *VR-Forces Users Guide*.
- ♦ The Developer Debug Overlay now includes a check box that allows you to enable the osgEarth Network Monitor. To learn more about using the overlay, see Section 6.17, “[Using the Developer Debug Overlay](#),” in *VR-Forces Users Guide*.
- ♦ VR-Forces has added support for high resolution displays. The user interface, including icons and text, stay visible on 4K monitors rather than becoming smaller at higher resolutions.
- ♦ By default, when the observer view is zoomed in, VR-Forces now performs a screen intersection on the area the observer is looking at and improves the LOD at that area and not in other areas. To learn how to configure this feature, see Section 53.6.7, “[Configuring the LOD Center in the Observer Mode](#),” in *VR-Forces Users Guide*.
- ♦ You can adjust the LOD Scale Factor from the Observer Control Panel, which allows you to scale the distance used to determine the level of detail.
- ♦ Back-end for terrain profiles. Users now have the option to query the back-end for the height data of the terrain for the terrain profile line. In the Terrain Profile Settings, there is a check box that allows users to specify that they want to use the back-end instead of the front-end for the data. For more information, please see Section 58.1.2, “[Configuring Terrain Profiles](#),” in *VR-Forces Users Guide*.

API Changes

- ♦ For Windows, *VR-Forces Developers Guide* is now shipped as a separate installer. To install it, run the *DevGuide.exe* installer.
- ♦ The new `addBackendCommandLine` example shows how you can add new command-line arguments to the back-end command line. See VR-Forces Back-end Examples in *VR-Forces Developers Guide* and *VR-Forces Migration Guide* for details.
- ♦ The `vrfGuiCoreQt` library has been reorganized to improve performance when building. Please see *VR-Forces Migration Guide* for instructions on adjusting the code.
- ♦ Added API calls to `VrfObject` for `convertToLocal()` and `convertToRemote()` to change object configurations between local and remote setup. There is no DIS- or HLA-specific implementation at this time. This is designed to support other (SpatialOS) network connections.
- ♦ The VR-Forces Sim Event Manager supports sending and receiving interactions (for example, fire and detonate) from non-HLA and non-DIS systems such as SpatialOS.
- ♦ Added encodings for fixed array (`DtRwFixedArray`) and sized string property (`DtRwSizedString`).
- ♦ The improved remote control API now has a new function, `addSimulationStatusChangedCallback`, to assist with the status of the overall simulation. Please see *VR-Forces Developers Guide* for more information.
- ♦ The `simplePlan` example was changed from a standalone executable example to a back-end plug-in. The new plan demonstrates how to construct and assign a simple plan to an existing entity for it to execute. See VR-Forces Back-end Examples in *VR-Forces Developers Guide* for details.
- ♦ The new Receiving Spot Reports remote control example uses the remote controller to receive spot reports from the back-end and display them to the user. This is a standalone application that runs in conjunction with VR-Forces. See Other Examples in *VR-Forces Developers Guide* for details.
- ♦ You can now set a `DtRwVector` state property from a `Location3D` in Lua. It stores the geocentric coordinates of the location. See section 4.7.4, “Supported Data Types for User-Created State Properties,” in *VR-Forces Developers Guide*.
- ♦ The `remoteControl` example has been updated to add a simple print command that prints the weather at a given location. This shows you how to get the weather using `DtRemoteEnvironmentController` and the `DtVrfRemoteController`.

Documentation Updates

Documentation has been updated for this release. The guides are provided as PDF files in the `./doc` directory. Online help is available from the VR-Forces Help menu. You can also find the most current PDFs at <https://www.mak.com/support/product-user-guides>. (You must be able to log in to the web site.)

Terrain and modeling information has been moved to the new *Adding Content to MAK Applications Reference Manual*. References direct you to relevant topics in that guide.

Fixed Bugs

The following problems identified in previous releases have been fixed:

- The outdated Grazing Sheep simulation object was removed. You can now create herds of animals, as described above. 5250
- Entities with gimbaled lasers now have the Lase Target task. 4839
- Fixed issues with editing the Zone location of simulation objects when using the MGRS coordinate system. 44679
- Added a continue-movement port to the rotary-wing aircraft guidance port group so that the pilot controller can determine whether to stop at the goal point it is given. 57366
- The stunned-animation, prone-animation, and dead-animation settings have been removed. These are now configured in the *character_animations_table.mtl* file. This is a change in the configuration of the DI-Guy controller, which can be found in the human movement system. 64681
- Fixed distorted visualization of PNG files for 2D icons in the Simulation Object Editor. 65008
- Improved movement of DI-Guys between navigation areas. 65118
- The Simulation Object Editor allowed wildcards in object types. 65159
- msgDump incorrectly reported that properties were updating. 65175
- The addFomClass example did not work and its HLA version support was unclear. 65295
- On multi-lane roads, spawn points put vehicles in the left lane rather than the right lane. 65388
- Rotary-wing and surface entities were not able to drop depth charges. 65417
- On Linux, entity path planning using Gameware could get stuck in rare circumstances where it would not on Windows. This has been fixed. 65527
- Fixed issue where, when one rotary-wing aircraft was following another, its speed varied around the leader's speed and the correction accelerations were larger than desired. 65551
- VR-Forces now correctly saved the attachment information in an observer state record. 65552
- The tooltips for the buttons on the Power Tables for applicable munitions have been corrected to accurately reflect the use of those buttons. 65553

- ♦ The Advanced button in the Select Power and Determinant dialog box in the SOE, which had no useful function, has been removed. You can now edit the powers and determinants directly. 65555
- ♦ When setting the attributes for indirect fire munitions, you could not specify that they not be simulated. This is now an option in the system definition file. 65563
- ♦ Crowd-based civilian entities have been improved to use less CPU when moving quickly, which could cause a severe frame rate drop when crowds were fleeing. 65565
- ♦ Removed entity-level spawn points from aggregate-level scenarios. 65576
- ♦ In aggregate-level scenarios, units without any equipment no longer display None in the Equipment tab of the Information dialog box. 65602
- ♦ Added developer guide documentation for some VR-Vantage based plug-in examples that were missing the information. 65679
- ♦ If an invulnerable unit was embarked on a non-invulnerable unit and the latter unit was destroyed, then the invulnerable embarked unit was also destroyed. This is fixed. 65718
- ♦ Under some circumstances, setting the altitude of a surface vessel caused it to rise into the air. 65736
- ♦ Ballistic gun was registering at least one round of ammunition available when ammunition was set to zero. It now considers the weapon to not be loaded. 65794
- ♦ The human weapons systems would sometimes hang when acquiring a target if the ammunition resource had been set to zero. 65795
- ♦ Fixed a memory leak when running DIS 5 or 6. 65834
- ♦ Entities no longer animate a grenade throwing action when they run out of grenades and are tasked to throw one. 65849
- ♦ The path calculated for rotary-wing entities to move along a route was too far from the route. 65862
- ♦ If you moved the Quick Launch toolbar so that it was floating and then new events became available during the course of a scenario, the toolbar would not resize to fit events that were longer than those originally shown. This is fixed. 65813
- ♦ Fixed an issue that caused docked panels to return to their original size after a user resized them. 65824
- ♦ Fixed a problem with police characters firing their weapon. 65851
- ♦ Fixed a bad trigger in the Bakersfield Defense scenario. 65873
- ♦ In aggregate-level scenarios, the sector-attacked animation was wrong on geocentric terrains. 65875
- ♦ Launch torpedo task will no longer launch a torpedo if the task is skipped. 65939
- ♦ Creating a new missile launcher system from an existing one in the /Simulation Object Editor failed. 65941
- ♦ Fixed an issue that caused the SOE to crash when the user created a missile from an existing one in a derived SMS, then deleted it, then saved the SMS. 65944

- ♦ The Simulation Object Editor did not save changes to the number of rounds fired for some weapons. 65945
- ♦ It was not possible to set the altitude of the vertices of a corridor tactical graphic in the Edit dialog box. 65946
- ♦ Fixed a problem with launching incorrect munitions from surface vessels. 65958
- ♦ Soldiers embarked on a Bradley no longer shoot entities outside of the vehicle, and can no longer be shot. 65959
- ♦ The Entity in Area trigger did not work at the force level. 65966
- ♦ If you had an Edit Script dialog box open and edited one of the script parameters, and changed the type of the parameter, when you clicked update and closed the parameter dialog, the new type was not displayed in the parameters widget of the Edit Script dialog box. 65985
- ♦ If you duplicated an existing script to create a new one, then the new script included an alias entry with the name of the original script. This is fixed. 66014
- ♦ When saving an SMS in the Simulation Object Editor, some parameters were not saved correctly. 66024
- ♦ DI-Guys with the moderate injury animation continued to fire their weapon. 66108
- ♦ The Fiat 124 entity was mis-classified as a military vehicle. This is fixed. 66127
- ♦ Fixed placement of SAMs in the Bomb Mission scenario so they are situated on the terrain. 66129
- ♦ When viewed from the top, parachuting soldiers were culled out too much. 66137
- ♦ If entities are embarked on another entity, they no longer fire nor can they be fired upon. 66141
- ♦ Removed the weapon system from the Emergency Medical Technician. It no longer has a weapon resource. 66149
- ♦ Parameters for managing reactive tasks were not saved on a rewind. This is fixed. 66173
- ♦ Fixed a DI-Guy character in the Subway Pattern of Life scenario to use only one head. 66186
- ♦ When an entity-level SMS was open in the SOE, some options displayed in the Edit menu that only applied to aggregate-level SMSs. They no longer display for entity-level SMSs. 66209
- ♦ When saving a scenario, items were occasionally duplicated in map state properties on an entity. This no longer occurs. 66247
- ♦ Cruise missiles detonated upon impact with water even though detonate-on-water- impact was set to false. 66304
- ♦ In aggregate-level scenarios there was no option on the Set menu for enabling or disabling subsystems. 66330
- ♦ In the Simulation Object Editor, when setting up random lists, it was possible to open multiple successive dialog boxes, but only one of them was valid for specifying list members. 66451

- ♦ Documentation for adding new powers for damage systems was incomplete. 66491
- ♦ If you created a Cloud Layer tactical graphic with the Cumulonimbus Capillatus cloud type and then moved it, the rain would stop displaying. This is fixed. 65662
- ♦ Fixed issue where copying and pasting civilian DI-Guy characters would cause the new entities to perform odd animations. 66188, 66145
- ♦ Pilots used a holding gun animation, but did not have a gun. 66223
- ♦ Fixed issue where copying a Global Plan to an entity's plan would change the order of the tasks in the plan. 66252
- ♦ Fixed a random crash that occurred when importing a scenario. 66274
- ♦ When audio was enabled, the Fish entity could be heard making the sounds of a submarine. This is fixed. 66380
- ♦ Fixed a logic issue that was causing the VR-Forces GUI to crash when the Laser Designator Information dialog box was opened and then closed. 66421
- ♦ Displayed bounding volumes of entities would not update if the bounding volume changed until the entity was selected. This has been fixed. 66440
- ♦ Entities were not fleeing detonations generated by suicide bombers. This is resolved. 66466
- ♦ Fixed a problem with the Copy Existing Simulation Model Set feature in SOE, where some launchers would not have the munitions or the munition names would not be copied correctly. 66469
- ♦ Fixed issues with the destroyed models for the Taxicab and Police Cruiser. 66481, 66483
- ♦ The SOE was saving the wrong keyword for range probability tables, which could cause issues with custom probability tables. This is resolved. 66519
- ♦ Fixed problem in calculation of indirect fire error in range. 66193
- ♦ When assigning the Fast Rope Insertion task, if you do not specify a Muster Point, the entities use the insertion point. 66532
- ♦ Fixed an issue when circle graphics were drawn from an ACO file, where the radius in the Shape Edit dialog box did not match the radius defined in the file. 66540
- ♦ There was an issue where creating a new entity-level SMS and promoting a missile would change the name of the munition. 66551
- ♦ The damage graphs in the SOE no longer assume all X scales are the same; it adjusts the X scale by power type. 66557
- ♦ Fixed an issue with the Move To Waypoint task for fixed wing vehicles. 66565
- ♦ Importing circle-type tactical graphics from point shapefiles now correctly renders the circle in the terrain. 66610
- ♦ Fixed an issue with creating a fixed wing entity that had a radar/emitter to prevent crashes. 66622
- ♦ When users right-clicked on a vertex of a tactical graphic and selected Move, the graphic shifted before allowing the user to move the vertex. This is resolved. 66626
- ♦ Resolved an issue with the ACO importer. 66631

- ♦ If a user chose an environment condition in the Environment Conditions dialog box and then pressed either R or S, the Rain or Snow radio button would be selected, respectively. This is fixed, and pressing those keys no longer affects the weather conditions. 66661
- ♦ Lua function getSubordinates() now returns subordinates in the order they are defined in the aggregate. 66701
- ♦ Fixed an issue where right-clicking on an entity and selecting **Embark On** from the context menu did not have the entity properly occupy a slot on the selected vehicle. 66719
- ♦ The Regenerate Random Visuals button in the Set 3D Models Visuals dialog box for DI-Guys in the SOE did not affect characters' appearance. It now works correctly. 66745
- ♦ Fixed a Simulation Object Editor (SOE) crash that sometimes occurred when switching between the Systems and Objects tabs. 66776
- ♦ Inverting a conditional expression using the "Invert Selection" check box under the Name tab did not work when an entity was selected. 66856
- ♦ If a user created a new entity and then modified the DIS ID afterwards, the SOE would crash. 66866
- ♦ Creating new ammunition from existing would replace the existing model rather than creating a new one. The new model is now correctly named differently from the original. 66872
- ♦ DI-Guy entities placed in an HLA scenario while it was playing would dance. This is resolved. 66892
- ♦ Fixed issue where DI-Guys would appear to dance when placed in an HLA scenario while it was playing. 66893
- ♦ Terrain profiles used for flat earth terrains were inaccurate. This is corrected. 66955
- ♦ If users created a derived SMS, added a new unit to that SMS and included something from the SMS it was derived from, they could not remove it as a subordinate. This is resolved. 66988
- ♦ In circumstances where multiple entities were embarked in the same slot, there was frame rate degradation and performance drain. This is resolved. 67001
- ♦ On initial installs for clean machines, users no longer need to manually install VC12 and VC8 distributables for CameraFX to work properly. 67084
- ♦ Settings for probable-error-in-range and probable-error-in-displacement in the *MK45NavalGun.sysdef* was too high. It has been adjusted lower. 67095
- ♦ Front-ends connecting to an HLA 1516 Evolved exercise did not properly display the overlays where entities were placed. Instead, they would display in the default overlay. This has been fixed to display entities in the correct overlay parent. 67100
- ♦ Tactical data link (TDL) messages were processing the check box as always true. This has been fixed to respect the selections made in the Tactical Data Link Settings page of Application Settings. 67102
- ♦ The rear gun on the Sovremennyy-class Destroyer was not pointed in the correct direction. 67121

- ♦ If users used the Create Multiple Simulation Objects dialog box to add two sets of simulation objects and then used the Delete button without selecting a group of objects (such as after deleting one group), the system would crash. 67125
- ♦ When there were multiple overlays and entities were placed in separate overlays, they could not be moved from one overlay to another. 67127
- ♦ In certain circumstances, fixed wings would move erratically. 67153
- ♦ File replacement was not working to see where the system was because it was trying to replace the SMS into the already replaced filename. This is fixed. 67188
- ♦ Fixed issue that caused generation of navigation data to hang on some terrains. 67202
- ♦ Fixed issue where, when Show Only Active Tactical Graphics was enabled in Tactical Graphics Display Settings, inactive tactical graphics did not appear on the GUI, including the Objects List Panel. 67203
- ♦ Multiple hit damage actuator was incorrectly calculating detonation context of collateral damage events. 67215
- ♦ Fixed the logic in the Lua interface task for isTaskAvailable. 67258
- ♦ Fixed configuration issues for certain rotary-wing entities that caused them to be unable to turn off rotor blades. 67270
- ♦ Fixed issue where selecting, editing, and moving multiple tactical graphics at once could result in a crash. 67283
- ♦ In the SOE, when selecting an entity that uses a system or editing a system that an entity uses, any previous filters on those tabs are cleared. 67291
- ♦ Convoys now have access for disaggregated set commands. 67302
- ♦ Automatic headlights are now disabled by default. This ensures that parked, unoccupied vehicles do not turn on their headlights, and also that vehicles do not turn on their headlights when it might be tactically inadvisable. 67389
- ♦ Users are no longer allowed to task an entity to embark on another entity while the first entity is still embarked on a different entity. 67452
- ♦ When disembarking an aggregate, its subordinate entities were not being disembarked at the same time. 67497
- ♦ Removed the Show Trigger Status button from the Issue Plan. 67546
- ♦ Line of sight calculations for weapon fire now originate at the muzzle position of the gun, not the attachment position. 67601
- ♦ When throwing grenades, human entities are now limited to a reasonable throwing distance. 67613
- ♦ Resolved issue where Send View Control did not detect default views. 67677
- ♦ Fixed an issue with human entities when AI and navigation were not enabled, where they would not complete a movement if an object was within an obstacle. For example, a human would not walk of a ramp on a helicopter to reach a waypoint inside the helicopter. 67702
- ♦ Fixed an issue where the SOE did not save multiple changes to detonation parameters for mine munition types. 67712

- ♦ Fixed an issue with the `--plugin` option of the `vrfgui` command that was preventing VR-Forces from loading VR-Vantage example plug-ins. 67713
- ♦ Set Reactive Task Enabled and Set Reactive Task Disabled were sometimes deleted from entity plans on scenario reload. This is resolved. 67721
- ♦ VR-Forces crashed if you created a global plan that had the same name as a simulation object. 67726
- ♦ Fixed an issue with loading recent scenarios in which attempting to load a scenario that no longer exists fails with no feedback. 67777
- ♦ If an entity had multiple main model visualizers, VR-Forces did not properly process object geometry. The Simulation Object Editor has a new parameter that causes VR-Forces to use the element definition to process object geometry instead of using just one specified file. 67779
- ♦ Fixed issue where human entities could not fast rope onto a waypoint that is clamped to another entity such as a ship. Please note that the waypoint must be clamped to the actual surface of the entity. If you need to place a waypoint on a ship, disable buoyancy before placing the waypoint. 67784
- ♦ Fixed an issue where the SOE crashed during an attempt to edit a damage value. 67803
- ♦ The Pattern Hold dialog boxes limited altitude to 9999 ft. 67806
- ♦ Canceling a task on the Task page of the Information dialog box now cancels only the selected task, not all tasks. 67811
- ♦ Some conditional statements did not allow you to choose Created Objects or Plan Variables. This is resolved. 67865
- ♦ A connection declaration was missing from the `.sysdef` file. This is resolved. 67930
- ♦ If there was a bad TCP connection to the back-end for scenario saves, the scenario did not save and there was no notification. There is now an error message to alert users. 67961
- ♦ On geocentric terrains, if you used **Set** → **Position** → **Altitude** to adjust the entity's altitude and chose AGL, the entity used MSL instead. This is resolved. 67977
- ♦ Rotary-wing aircraft's landing was made more robust to avoid unnecessary crash landings. 67981
- ♦ An M4 rifle weapon system was created and configured onto the three entity types that carry M4s. 67983
- ♦ Stability was improved in the SOE to avoid possible crashes when editing a shared visuals model. 67987
- ♦ Added missing include file to `stateRepositoryWithExtendedAttributesDIS.h`, which was causing examples not to build out of the box. 67993
- ♦ Fixed issue where the M1A2 turret machine guns would not fire simultaneously and rotate the main turret as needed to shoot at targets, if not conflicting with the main gun targeting. 68015
- ♦ Improved vehicles' reading of ocean buoyancy to ensure that amphibious craft could move on land. 68025
- ♦ Fixed issue where editing models using Set 3D Models Visuals would occasionally cause the SOE to crash. 68036

- ♦ Civilian entities that have the flee-from-threat system now correctly flee from the detonation of any munition. Note that they no longer flee from fire events by default. This can be turned back on by enabling it in the system parameters in the SOE. A flee from fire event only lasts 5 seconds (modifiable in the flee-from-threat script code). 68116
- ♦ Users can now write plug-ins to extend the navigation generation capability to generate custom points in the navigation data. 68134
- ♦ When a ground vehicle is path planning and terrain data has not yet paged in, the entity is now able to clamp to the nav data to continue path planning and moving to its destination. 68168
- ♦ Fixed an issue entityList plug-in. 68175
- ♦ Muzzle flash directional vector was incorrect when firing at entity at the same altitude. This is fixed. 68184
- ♦ Tanks did not order the target list by distance to target. 68204
- ♦ Instead of crashing as a way to show a task that used to be part of a task command no longer exists, VR-Forces opens the dialog and allows the user to choose the task again. The text in the plan now shows that the old task is missing. 68209
- ♦ Closing a scenario caused the fire and detonate managers to be reinitialized, which caused multiple connections to events. This is resolved. 68223
- ♦ `--fullScreen` command line argument is now correctly respected on the command line and will supersede any layout specifics. 68272
- ♦ Laser controllers now respect all rules of engagement as if the laser-guided controller were a target selection controller. 68338
- ♦ Edits to munition tracer type were not recognized as a change. This is fixed. 68391
- ♦ Fixed issue where `ReflectedEnvironmentProcessList` was not correctly initialized in remote controller in HLA. 68398
- ♦ Cruise missile flight had a bug where it would not fly low over the water to a naval surface target. This is corrected. 68425
- ♦ Scenarios with DI-Guy characters now use the DI-Guy states from the current entity information rather than what was saved in the scenario when it was first created. This ensures that DI-Guy characters use up-to-date settings, even in older scenarios. 68437
- ♦ When using scripted tasks, it was possible to have one of the ranges of entry on the fields to be much larger (or smaller) than expected. This has been resolved. 68438
- ♦ When you double-click on a route or a point on a route that is used as an ingress or egress route for embarkation, the Z values now respect their current values and not change to 0. 68444
- ♦ MSDL output did not previously include the function code letters in the symbol identifier, positions 5-10, for units. These positions are now set based on the Subcategory value in the DIS entity type enumeration. 68449
- ♦ `DtDiGuyGestureController` now recognizes that the task has been stopped before the gesture completed, and invokes `stopGesture()` to have the entity stop performing the gesture. 68467

- ♦ Generating navigation data did not make door nav edges when the SDK was not installed. This is fixed. 68476
- ♦ When editing a route and changing the altitude in the Edit Route dialog box, if the route point was at a multi-level location, the route point would clamp to the closest altitude above ground at the given height entered. For example, if a route point was on a mountain whose altitude was 1000m and you entered 500m AGL for the point, the point would actually be placed at 500MSL (500 meters above terrain height 0). Now the route point is correctly placed at 1500m. 68518
- ♦ In Lua scripts, Lua MakeAreaGeometry and MakePathGeometry didn't work. This is fixed 68520
- ♦ Paratrooper entities now use more varied appearances. 68536
- ♦ Fixed issue with the Formation Flight scenario that would cause it to crash. 68539
- ♦ You can enter headings of negative value, but they are now be shown as between 0 and 359 degrees after you save For example, -150 displayed as 210. 68570
- ♦ Removed unsupported and unused setHostilityFilename from the Remote Control Interface. 68571
- ♦ Fixed possible crash when creating civilian crowds on Linux. 68573
- ♦ The scenarioMetrics example now was not documented. 68583
- ♦ The Appearance setting for embarkation slots has a more sensible default. 68581
- ♦ Fixed issue where DI-Guy characters would use a stationary animation instead of a moving one when moving slower than the speed used for the moving animation. VRF-1988
- ♦ Tactical smoke modeling regarding interaction with wind has been improved. VRF-2034
- ♦ Component systems did not save out Lua information. This sometimes caused problems with a previously saved torpedo homing task. The Lua scripts now correctly save out the system information for deserialization. VRF-2043
- ♦ Ground vehicles now obey the turning limitation imposed by their maximum lateral acceleration parameter. In some existing scenarios, depending on the speed of a vehicle, it may not follow a curving path in the same way that it previously did. To make a vehicle strictly follow a curving path, edit the maximum lateral acceleration to be a large value (for example, 50). VRF-2064
- ♦ VRF GUI changed the method it uses to check whether a navigation area has been processed. It now checks for the existence of a text file created at the end of the generation process. For example, for the *./user-Data/navData/Ala Moana* navigation area, it looks for a file called *Ala Moana.navGenConfig.generated*. If you have your own navigation area and it shows up in red and you do not want to regenerate the nav mesh, you only need to create an empty text file with *[myNavArea].navGenConfig.generated*. VRF-2069

- ♦ The *fixed-maverick-missile-launcher.sysdef* file was missing an entity target priority entry for air entities. This is fixed. VRF-2095
- ♦ Updated the configuration for the vertical missile launcher to prevent it from targeting torpedoes. VRF-2097
- ♦ Parachute to Target task was ignoring the Muster Point. This is fixed. VRF-2111
- ♦ M26 Rocket detonation power has been reduced to be more realistic. VRF-2124
- ♦ Improved entity wandering for smaller areas. VRF-2141
- ♦ MSDL importer now imports entities that are not part of units in the MSDL file. VRF-2167
- ♦ When any sensor is disabled by disabling the sensor system, all sensor contacts are lost. When the system is re-enabled, the sensor must reacquire the lost contacts. VRF-2170
- ♦ If a user deleted a phase line that was referenced in a plan, the console had continuous messages about it. This is fixed. VRF-2176
- ♦ Fixed an issue that caused the GUI to crash in aggregate-level scenarios when using the Preferred Targets set data request on a unit. VRF-2179
- ♦ The function `DtCgf::saveScenario()` was not saving a usable scenario file. This has been fixed. VRF-2183
- ♦ The LAV-M entity now has a mortar system configured. VRF-2211

Known Problems

- ♦ There are a few issues that require you to add the application name to the *BlackApps.dat*:
 - Under certain circumstances, opening VR-Forces on a second display prevents the program from starting.
 - In addition, launching from the main display and then moving the mouse cursor to the other monitor causes the program to freeze and not respond.

If you experience any of these issues, edit the nahimic *BlackApps.dat* file and add the application name (for example, *vrfLauncher.exe*) to the list. This file might be found in *C:\ProgramData\A-Volute\A-Volute.Nahimic\Modules\Scheduled\Configurator*, or *C:\ProgramData\A-Volute\A-Volute.28054DF1F58B4\Modules\ScheduledModules\Configurator*, or something similar. You can search *C:\ProgramData* for *BlackApps.dat* to locate it.

- ♦ There is a known problem with VR-Forces and CentOS 8 running out of memory. When the OS runs out of memory or starts using the swap memory, it can become unresponsive. Here are some potential solutions:
 - Adjust the terrain being loaded in VR-Vantage to have fewer osgEarth layers and simpler models to reduce the memory consumption.
 - Add more RAM to your computer.
 - Upgrade the Linux kernel to at least version 5.7. We have found that the default kernel of 4.18 becomes unresponsive when the swap is being used but the 5.7 kernel does not have this problem.
- ♦ On Linux machines, when you use the built-in screen capture feature, the screenshot is not adjusted for gamma corrected. It appears dark in the default image viewer on Linux but displays correctly in other applications.
- ♦ Feature indexing for model layers in osgEarth terrains is not supported by VR-Forces and must be disabled on all model layers to avoid performance issues and the possibility of crashes:

```
<model>
  <feature_indexing enabled="false"/> <!-- include this with every model
  section for VR-Vantage. If enabled, feature_indexing causes performance
  issues and crashes on Linux -->
  <!-- rest of model layer setup here-->
</model>
```