

Autonomous Vehicles



VBS4 24.1.1



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The BISim Wiki is the primary resource on VBS4 scripting:

<https://sqf.bisimulations.com/display/SQF/VBS+Scripting+Reference>

PhysX

VBS4 uses the PhysX physics engine. For more information on PhysX visit the Nvidia site.

<https://gameworksdocs.nvidia.com/simulation.html>



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1. Autonomous Vehicle Operations

VBS4 includes the Battlefield Information Systems Application (BISA) UI, as an extension to the VBS4 C2 View to enable command of Autonomous Vehicles (AVs) in integrated operations.

All technology and capabilities of AVs and BISA are loosely based on real-world technologies. VBS4 allows these systems to be quickly implemented and tested in the virtual-world to train doctrine, and Tactics, Techniques, and Procedures (TTP).

The BISA functionality is available for all unmanned vehicles with some limitations, but is specifically designed to work with a set of UK-exclusive AVs.

NOTE

In addition, any Land vehicle can be turned into an AV (use the autopilot mode). For more information, see [AV Mission Preparation \(on page 14\)](#).

For a full list of specific AV models, see [Autonomous Vehicles List \(on page 8\)](#).

Review [Roles in BISA \(on the next page\)](#) to understand how the ORBAT structure and permissions enables BISA functionality.

Follow this process:

1. Administrators or Mission Designers create an AV scenario.

For more information, see [AV Mission Preparation \(on page 14\)](#).

2. Administrators or Instructors start and operate a networked AV scenario.

For more information, see [AV Mission Execution \(on page 26\)](#).

3. Users join the AV scenario and control AVs using the BISA View (C2).

For more information, see [BISA Interface Overview \(on page 29\)](#).

4. Users and Administrators interact with AVs using the following functionality:

- [Assigning AV Ownership \(on page 36\)](#)
- [Commanding AVs \(on page 40\)](#)
- [Using the Commander Machine Interface \(CMI\) \(on page 54\)](#)
- [Activating the AV Autopilot \(on page 51\)](#)
- [Using the Driver Machine Interface \(DMI\) \(on page 52\)](#)

5. During the scenario, AVs provide event reports in the [Reports Panel \(on page 31\)](#).

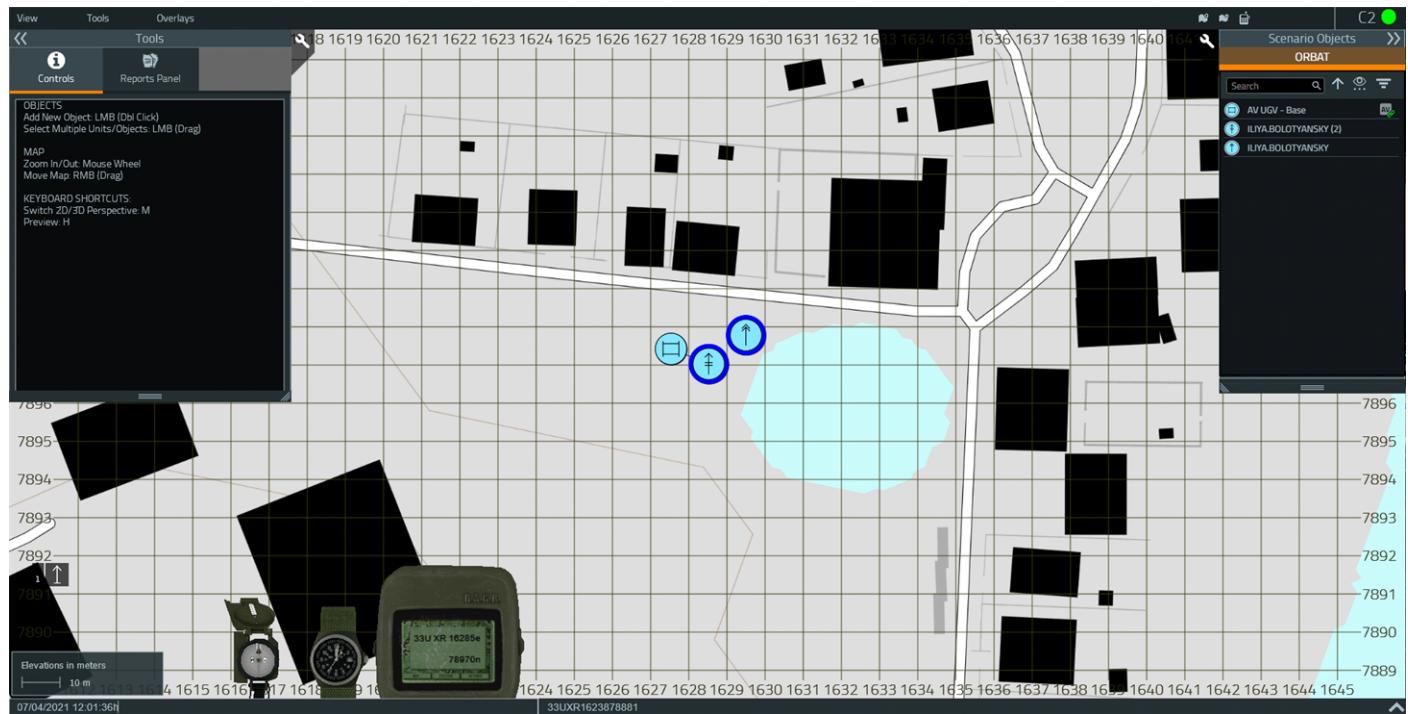
6. After an AV scenario, Instructors or users can review it using After Action Review (AAR).

For more information, see the VBS4 After Action Review Manual.

1.1 Roles in BISA

Each participant in a scenario has their own view, and with information specific to them.

Image-1: Commander view



BISA displays information and access to functionality based on the following roles:

- **Administrators / Instructors**

Run the scenario and have full control and visibility of BISA functionality using the Editor in Execute mode.

- **Commander**

Commanders are defined by the ORBAT structure set up for the mission. A commander is part of a higher echelon with sections under them in the command structure. For more information, see [Creating Command Structures in the VBS4 Editor Manual](#).

Commanders have access to the following information in the [Reports Panel \(on page 31\)](#):

- The locations of AVs in the scenario controlled by users in their command structure.
- Receive reports from AVs in the scenario controlled by users in their command structure.
- All waypoints in the scenario for AVs controlled by users in their command structure.

- **Section Leader**

Section Leaders are defined by the leadership of their group as set up for the mission. For more information, see [Adding Groups in the VBS4 Editor Manual](#).

Section Leaders can assign AV Ownership to members of their group, as described in [Assigning AV Ownership \(on page 36\)](#).

Section Leaders have access to the following information in the [Reports Panel \(on page 31\)](#):

- Locations of AVs assigned to members of their section.
- They receive reports from AVs assigned to members of their section.
- They can see all waypoints for AVs assigned to members of their section.

- **Trainee**

Trainees are the remaining units and members of VBS4 groups, without leadership roles.

Trainees can assign AV Ownership of unassigned AVs to themselves, as described in [Assigning AV Ownership \(on page 36\)](#).

Trainees have access to the following information in the [Reports Panel \(on page 31\)](#):

- Locations of their own AVs.
- They receive reports from their own AVs.
- They only see waypoints for their own AVs.

1.2 Autonomous Vehicles List

VBS4 contains the following specific Autonomous Vehicle (AV) and AV-compatible models.

i NOTE

Vehicles with **AV** in their model name are driverless, while vehicles without **AV** can be controlled by either a driver or operate as AVs (they are AV-compatible).

In addition, you can make any Land vehicle AV-compatible using the **Autopilot** option in the vehicle Object Properties dialog in the Editor. For more information, see [AV Mission Preparation \(on page 14\)](#).

GB Army AV - THeMIS UGV Variants

i NOTE

AVs in this category are equipped with the Wide Field of View (WFOV) camera. For more information, see [Manual Control in Commanding AVs \(on page 40\)](#).

- **AV UGV - DFSup** - MILREM THeMIS with .50 cal HMG.
- **AV UGV - ATGW** - MILREM THeMIS with 4 x ATGMs.
- **AV UGV - C-UAS** - MILREM THeMIS with Directed Energy Weapon to counter UAS.
- **AV UGV - Recce** - Ground recce - MILREM THeMIS (TITAN Sentry).
- **AV UGV - IDF** - Artillery - 122mm rockets.
- **AV UGV - C-Bty** - Artillery / rockets locating.
- **AV UGV** - Base.
- **AV UGV - Small Arms** - MILREM THeMIS Resupply variant with small arms ammunition.
- **AV UGV - Heavy Arms** - MILREM THeMIS Resupply variant with heavy arms ammunition.
- **AV UGV - Medevac** - MILREM THeMIS Medevac variant equipped with 2 litters.

GB Army AV - Support Vehicle Variants

- **AV Support Vehicle - Supply** - Rations, medical supplies, spares - MAN SV Truck-esque.
- **AV Support Vehicle - Fuel** - Fuel / water - MAN SV Unit Support Tanker-esque.
- **AV Support Vehicle** - Ammo.
- **Support Vehicle 6T - Flat Platform** - 4 x 4 chassis, flat platform truck.
- **Support Vehicle 6T - Cargo** - 4 x 4 chassis, cargo truck.
- **Support Vehicle 6T - Troop Carrier** - 4 x 4 chassis, 14-seat troop carrier truck.

- **Support Vehicle 6T - Flat Platform, Crane** - 4 x 4 chassis, flat platform truck.
- **Support Vehicle 6T - Cargo, Crane** - 4 x 4 chassis, cargo truck with crane.
- **Support Vehicle 6T - Troop Carrier, Crane** - 4 x 4 chassis, 8-seat troop carrier truck with crane.
- **Support Vehicle 6T - Flat Platform, Up Armored** - 4 x 4 chassis, flat platform truck, cab up-armored.
- **Support Vehicle 6T - Cargo, Up Armored** - 4 x 4 chassis, cargo truck, cab up-armored.
- **Support Vehicle 6T - Troop Carrier, Up Armored** - 4 x 4 chassis, 14-seat troop carrier truck, cab up-armored.
- **Support Vehicle 6T - Flat Platform, Crane, Up Armored** - 4 x 4 chassis, flat platform truck, cab up-armored.
- **Support Vehicle 6T - Cargo, Crane, Up Armored** - 4 x 4 chassis, cargo truck with crane, cab up-armored.
- **Support Vehicle 6T - Troop Carrier, Crane, Up Armored** - 4 x 4 chassis, 8-seat troop carrier truck with crane, cab up-armored.
- **Support Vehicle 6T - Flat Platform, Up Armored, L7A2** - 4 x 4 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 6T - Cargo, Up Armored, L7A2** - 4 x 4 chassis, cargo truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 6T - Troop Carrier, Up Armored, L7A2** - 4 x 4 chassis, 14-seat troop carrier truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 6T - Flat Platform, Crane, Up Armored, L7A2** - 4 x 4 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 6T - Cargo, Crane, Up Armored, L7A2** - 4 x 4 chassis, cargo truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 6T - Troop Carrier, Crane, Up Armored, L7A2** - 4 x 4 chassis, 8-seat troop carrier truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Flat Platform** - 6 x 6 chassis, flat platform truck.
- **Support Vehicle 9T - Cargo** - 6 x 6 chassis, cargo truck.
- **Support Vehicle 9T - Troop Carrier** - 6 x 6 chassis, 14-seat troop carrier truck.
- **Support Vehicle 9T - Flat Platform, Crane** - 6 x 6 chassis, flat platform truck.
- **Support Vehicle 9T - Cargo, Crane** - 6 x 6 chassis, cargo truck with crane.
- **Support Vehicle 9T - Troop Carrier, Crane** - 6 x 6 chassis, 8-seat troop carrier truck with crane.
- **Support Vehicle 9T - Flat Platform, Up Armored** - 6 x 6 chassis, flat platform truck, cab up-armored.

- **Support Vehicle 9T - Cargo, Up Armored** - 6 x 6 chassis, cargo truck, cab up-armored.
- **Support Vehicle 9T - Troop Carrier, Up Armored** - 6 x 6 chassis, 14-seat troop carrier truck, cab up-armored.
- **Support Vehicle 9T - Flat Platform, Crane, Up Armored** - 6 x 6 chassis, flat platform truck, cab up-armored.
- **Support Vehicle 9T - Cargo, Crane, Up Armored** - 6 x 6 chassis, cargo truck with crane, cab up-armored.
- **Support Vehicle 9T - Troop Carrier, Crane, Up Armored** - 6 x 6 chassis, 8-seat troop carrier truck with crane, cab up-armored.
- **Support Vehicle 9T - Flat Platform, Up Armored, L7A2** - 6 x 6 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Cargo, Up Armored, L7A2** - 6 x 6 chassis, cargo truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Troop Carrier, Up Armored, L7A2** - 6 x 6 chassis, 14-seat troop carrier truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Flat Platform, Crane, Up Armored, L7A2** - 6 x 6 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Cargo, Crane, Up Armored, L7A2** - 6 x 6 chassis, cargo truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T - Troop Carrier, Crane, Up Armored, L7A2** - 6 x 6 chassis, 8-seat troop carrier truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Flat Platform** - 6 x 6 chassis with improved mobility, flat platform truck.
- **Support Vehicle 9T IMM - Cargo** - 6 x 6 chassis with improved mobility, cargo truck.
- **Support Vehicle 9T IMM - Troop Carrier** - 6 x 6 chassis with improved mobility, 14-seat troop carrier truck.
- **Support Vehicle 9T IMM - Flat Platform, Crane** - 6 x 6 chassis with improved mobility, flat platform truck.
- **Support Vehicle 9T IMM - Cargo, Crane** - 6 x 6 chassis with improved mobility, cargo truck with crane.
- **Support Vehicle 9T IMM - Troop Carrier, Crane** - 6 x 6 chassis with improved mobility, 8-seat troop carrier truck with crane.
- **Support Vehicle 9T IMM - Flat Platform, Up Armored** - 6 x 6 chassis with improved mobility, flat platform truck, cab up-armored.

- **Support Vehicle 9T IMM - Cargo, Up Armored** - 6 x 6 chassis with improved mobility, cargo truck, cab up-armored.
- **Support Vehicle 9T IMM - Troop Carrier, Up Armored** - 6 x 6 chassis with improved mobility, 14-seat troop carrier truck, cab up-armored.
- **Support Vehicle 9T IMM - Flat Platform, Crane, Up Armored** - 6 x 6 chassis with improved mobility, flat platform truck, cab up-armored.
- **Support Vehicle 9T IMM - Cargo, Crane, Up Armored** - 6 x 6 chassis with improved mobility, cargo truck with crane, cab up-armored.
- **Support Vehicle 9T IMM - Troop Carrier, Crane, Up Armored** - 6 x 6 chassis with improved mobility, 8-seat troop carrier truck with crane, cab up-armored.
- **Support Vehicle 9T IMM - Flat Platform, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Cargo, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, cargo truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Troop Carrier, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, 14-seat troop carrier truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Flat Platform, Crane, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Cargo, Crane, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, cargo truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM - Troop Carrier, Crane, Up Armored, L7A2** - 6 x 6 chassis with improved mobility, 8-seat troop carrier truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T, UST** - 6 x 6 chassis, Unit Support Tanker.
- **Support Vehicle 9T, UST - Up Armored** - 6 x 6 chassis, Unit Support Tanker, cab up-armored.
- **Support Vehicle 9T, UST - Up Armored, L7A2** - 6 x 6 chassis, Unit Support Tanker, cab up-armored, L7A2 MG turret.
- **Support Vehicle 9T IMM, UST** - 6 x 6 chassis with improved mobility, Unit Support Tanker.
- **Support Vehicle 9T IMM, UST - Up Armored** - 6 x 6 chassis with improved mobility, Unit Support Tanker, cab up-armored.
- **Support Vehicle 9T IMM, UST - Up Armored, L7A2** - 6 x 6 chassis with improved mobility, Unit Support Tanker, cab up-armored, L7A2 MG turret.
- **Support Vehicle 15T - Flat Platform** - 8 x 8 chassis, flat platform truck.
- **Support Vehicle 15T - Cargo** - 8 x 8 chassis, cargo truck.
- **Support Vehicle 15T - Flat Platform, Crane** - 8 x 8 chassis, flat platform truck.
- **Support Vehicle 15T - Cargo, Crane** - 8 x 8 chassis, cargo truck with crane.

- **Support Vehicle, EPLS** - 8 x 8 chassis, with Enhanced Pallet Load System.
- **Support Vehicle 15T - Flat Platform, Up Armored** - 8 x 8 chassis, flat platform truck, cab up-armored.
- **Support Vehicle 15T - Cargo, Up Armored** - 8 x 8 chassis, cargo truck, cab up-armored.
- **Support Vehicle 15T - Flat Platform, Crane, Up Armored** - 8 x 8 chassis, flat platform truck, cab up-armored.
- **Support Vehicle 15T - Cargo, Crane, Up Armored** - 8 x 8 chassis, cargo truck with crane, cab up-armored.
- **Support Vehicle, EPLS - Up Armored** - 8 x 8 chassis, with Enhanced Pallet Load System, cab up-armored.
- **Support Vehicle 15T - Flat Platform, Up Armored, L7A2** - 8 x 8 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 15T - Cargo, Up Armored, L7A2** - 8 x 8 chassis, cargo truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 15T - Flat Platform, Crane, Up Armored, L7A2** - 8 x 8 chassis, flat platform truck, cab up-armored, L7A2 MG turret.
- **Support Vehicle 15T - Cargo, Crane, Up Armored, L7A2** - 8 x 8 chassis, cargo truck with crane, cab up-armored, L7A2 MG turret.
- **Support Vehicle, EPLS - Up Armored, L7A2** - 8 x 8 chassis, with Enhanced Pallet Load System, cab up-armored, L7A2 MG turret.
- **Support Vehicle, Recovery** - 8 x 8 chassis with improved mobility, vehicle recovery truck.
- **Support Vehicle, Recovery - Up Armored** - 8 x 8 chassis with improved mobility, vehicle recovery truck, cab up-armored.
- **Support Vehicle, Recovery - Up Armored, L7A2** - 8 x 8 chassis with improved mobility, vehicle recovery truck, cab up-armored, L7A2 MG turret.

GB Army AV - DF Heavy Variants (Wheeled and Tracked)

- **AV DF Heavy** - Armed with 120mm cannon, 7.62 x 51 coaxial machine gun, and smoke launcher.

GB Army AV - ASV Air Variants

- **ASV Air** - Medium quadcopter UAS. Unarmed.
- **ASV Air ATGW** - Large quadcopter UAS. Armed with 4 x Brimstone or Successor.

NOTE

These variants are only available under the **GB Army AV - Woodland** tab.

GB Army AV - Centaur Variants

NOTE

AVs in this category are equipped with the Wide Field of View (WFOV) camera. For more information, see [Manual Control in Commanding AVs \(on page 40\)](#).

- **AV Centaur - Base.**
- **AV Centaur - Small Arms** - Resupply variant with small arms ammunition.
- **AV Centaur - Heavy Arms** - Resupply variant with heavy arms ammunition.
- **AV Centaur - Medevac** - Medevac variant equipped with 2 litters.

GB Army AV - Malloy UAV Variants

- **T150 UAS - Base.**
- **T150 UAS Small Arms** - Resupply variant with small arms ammunition.

2. AV Mission Preparation

One of the primary VBS Editor use cases for AVs is the creation of engaging and realistic training scenarios that demonstrate the capabilities of BISA for integrated AV operations.

Select a terrain and use VBS Editor in Prepare mode to add the personnel, vehicles, objectives, and hazards required for your AV training requirements.

Follow these steps:

1. Use VBS Editor to create a new Scenario, or edit an existing one.

For more information, see [Scenario Preparation in the VBS4 Editor Manual](#).

2. Go to **View > Map Settings**:

- a. Click the **C2** tab, and check **Enable Autonomous Vehicles**.
- b. Click the **Icons** tab, and check **Show Side of Empty Vehicles**.
- c. In the **For BLUFOR Side** drop-down, select **Only Those on Player's Side**.
- d. Click **Apply**.

For more information, see [Map Settings \(on page 18\)](#).

3. Use the Editor UI to add the units and groups required for your scenario, and create the ORBAT structure that defines the visibility and access to functionality for the different [Roles in BISA \(on page 6\)](#).

For more information, see the following topics in the VBS4 Editor Manual:

- Adding Unit
- Adding Groups
- Creating Command Structures

4. Use the Editor UI to add the autonomous vehicles required for the AV scenario.

See [Adding Vehicles in the VBS4 Editor Manual](#) to add the available AVs.

- GB Army AV - THeMIS UGV variants
- GB Army AV - AV Support Vehicle variants
- GB Army AV - AV DF Heavy variants
- GB Army AV - ASV Air variants
- GB Army AV - Centaur Variants
- GB Army AV - Malloy UAV Variants

For a full list of available AVs, see [Autonomous Vehicles List \(on page 8\)](#).

5. In addition, any Land vehicle can become AV-enabled and be used as an AV.

For new vehicles:

- a. In the Object Properties dialog, click **Advanced** to expand the advanced vehicle options.
- b. In the **Autopilot** drop-down, select one of the following options:

 **NOTE**

The **Autopilot** drop-down is only available, if the following criteria is met:

- The vehicle is a Land vehicle, and not already an AV (UGV / UAV).

- **Not Available** - The vehicle is not used as an AV.
- **Active** - The AV autopilot is active and the vehicle can be used as an AV.
- **Inactive** - The AV autopilot is inactive and the vehicle cannot be used as an AV.

 **TIP**

For existing AV-enabled vehicles, you can change the autopilot state by double-clicking the vehicle on the map or in the Scenario Objects Panel, and in the Object Properties dialog, changing **Active** / **Inactive** in VBS Editor (Prepare / Execute Mode).

- c. Click **OK**.

For existing vehicles, right-click a vehicle or a group of vehicles on the map or in the Scenario Objects Panel, and select **Autonomous Vehicle > Activate Autopilot / Deactivate Autopilot** to activate / deactivate the AV autopilot.

 **NOTE**

The **Autonomous Vehicles** context menu is not available for Control AI UAVs.

Alternatively, you can set the autopilot mode for any Land vehicle, using the SQF commands: [setAutopilotState](https://sqf.bisimulations.com/display/SQF/setAutopilotState) (<https://sqf.bisimulations.com/display/SQF/setAutopilotState>), [getAutopilotState](https://sqf.bisimulations.com/display/SQF/getAutopilotState) (<https://sqf.bisimulations.com/display/SQF/getAutopilotState>), [getAutopilot](https://sqf.bisimulations.com/display/SQF/getAutopilot) (<https://sqf.bisimulations.com/display/SQF/getAutopilot>).

Use the [Commander Machine Interface \(CMI\) Editor Object \(on page 24\)](#) to allow commanders to view the status information of each vehicle assigned to them, when the AV scenario runs.

6. Use Markers to designate specific areas in the terrain as threats.

- a. Press **F6** or select **(F6) Marker** from the Editor Objects List.
- b. Place your cursor on the map, and do one of the following:
 - Double-click the **LMB**.
 - Click the **RMB**, and select **New Object** from the context menu.

The Object Properties dialog opens.

- c. Select **Ellipse** from the Category drop-down.
- d. **Size (Left-Right)** and **Size (Up-Down)** must be the same size to specify a circular area.
- e. Click **OK**.
- f. The Marker is placed on the map.

AVs avoid the defined areas if **Avoid Threats** is set when defining their Waypoints, as described in [AV Assign Waypoints \(on page 44\)](#).

7. Add Waypoints for your AVs to select from.

- a. Select **(F3) Waypoints** from the Editor Objects List.
- b. Place your cursor on the map, and do one of the following:
 - Double-click the **LMB**.
 - Click the **RMB**, and select **New Object** from the context menu.

The Object Properties dialog opens.

- c. In the **Behavior** list, select one of the following Waypoint types: **Convoy**, **UGV Control**, **UGV Control - Defend**.

NOTE

Only these waypoint types can be used with AVs.

- d. Set the Waypoint properties, as described in step 3 of [AV Assign Waypoints \(on page 44\)](#).

NOTE

[AV Assign Waypoints \(on page 44\)](#) describes how to create and assign waypoints.

- e. Click **OK**.

The Waypoint is placed on the map.

8. Preview and save the mission.

A saved Scenario is available for use in the Battlespaces List:

- Play the Scenario as a single user.
For information about controlling your character, see [Character Control in the VBS4 Trainee Manual](#).
- Use VBS Editor in Prepare mode to edit the Scenario.
- For information about controlling AV objects and entities, see [BISA Interface Overview \(on page 29\)](#).
- Run the mission as a Networked Multiplayer mission as the administrator.
For information about Execute mode, see [AV Mission Execution \(on page 26\)](#).
- Use VBS Editor in Prepare mode to edit the mission.

For more information about the other objects and tools available, see the VBS4 Editor Manual.

2.1 Map Settings

The Map Settings dialog is used to adjust map and Fog of War (FoW) settings for Trainees in Command and Control (C2) mode. The settings in the dialog can be applied to both units and vehicles, which are often collectively referred to as **entities**.

FoW refers to the situational awareness of players, and what they are aware of in a scenario. Using the Map Settings dialog, you can configure maximum FoW, which means that when you open the 2D map, only entities in your direct line-of-sight are visible. Entities over hills or behind buildings are not displayed. Alternatively, you can configure minimum FoW, which means that you can see all entities in the scenario on the 2D map at all times, no matter where they are. In addition, you can adjust the settings so that players have all knowledge of their own side, but no knowledge of an enemy.

The Map Settings dialog also allows you to add / edit / remove layers of offline and / or online map data, from VBS4 and third parties.

For more information about C2 mode, see Command and Control (C2) Screen in the VBS4 Trainee Manual.

Follow these steps:

1. Open the Map Settings dialog in the VBS Editor menu (**View > Map Settings**).

The Map Settings dialog opens.

2. Use the settings in the following dialog tabs:

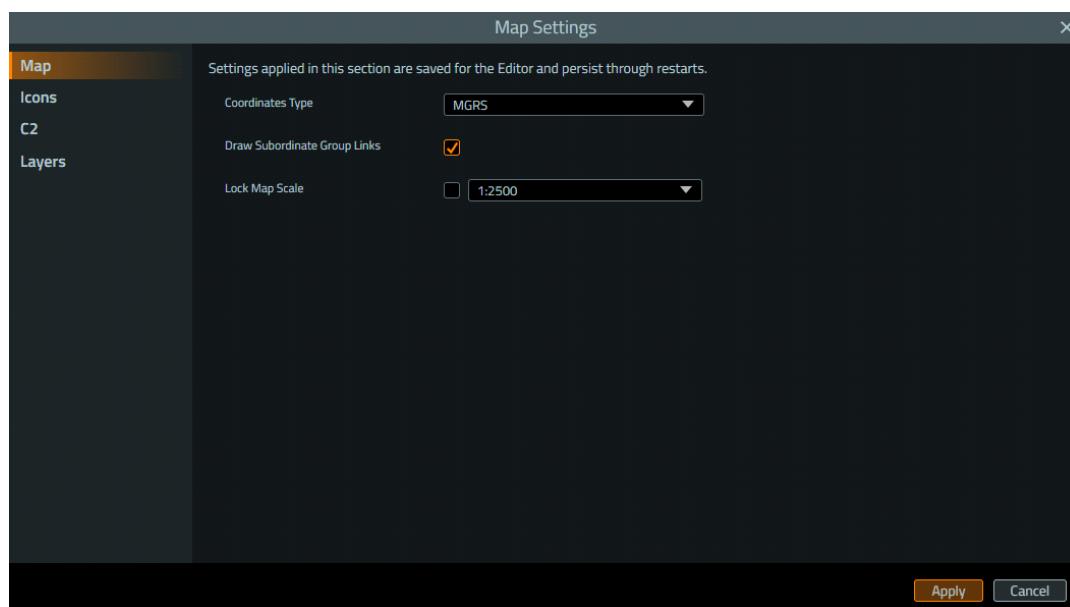
- [Map Tab \(on the next page\)](#)
- [Icons Tab \(on page 20\)](#)
- [C2 Tab \(on page 22\)](#)
- [Layers Tab \(on page 23\)](#)

3. Click **Apply** to save the settings.

The settings are saved in either your user Profile or the exported mission, meaning that next time you open VBS4 or an exported mission, the settings are as you left them.

2.1.1 Map Tab

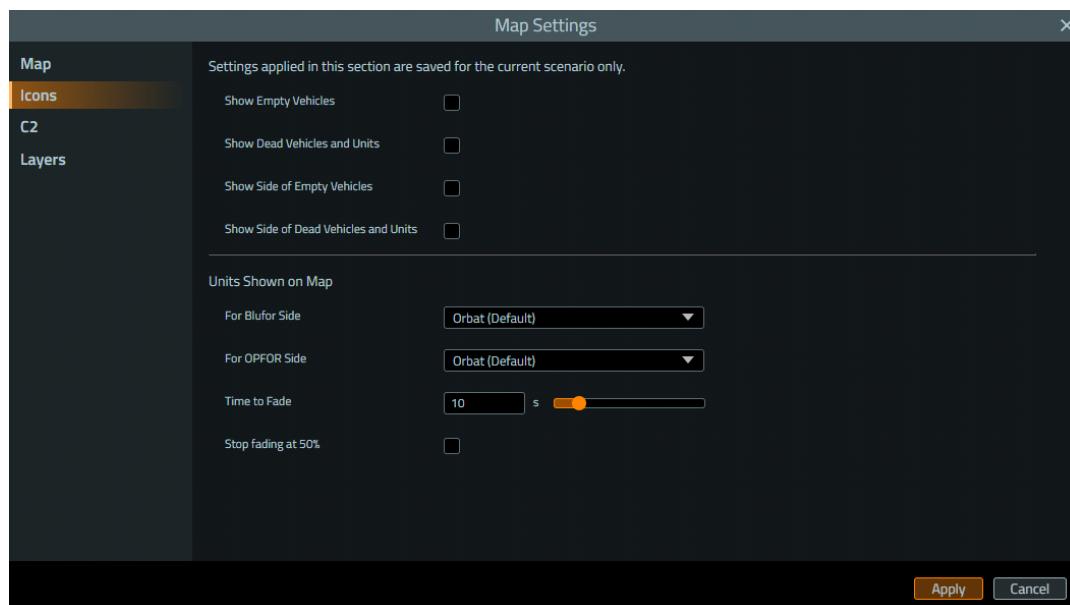
The settings on this tab are used to adjust map coordinates / scale.



Setting	Description
Coordinates Type	<p>Sets the coordinates type for the 2D map. Use the drop-down to select from the following options:</p> <ul style="list-style-type: none"> • MGRS • Lat / Long • BNG • LLMS • UTM <div style="border: 1px solid #8B8B00; padding: 5px; margin-top: 10px;"> ★ FEATURE NOTICE This coordinates type is UK-specific, and cannot be used in other regions of the Whole-Earth Terrain. </div>
Draw Subordinate Group Links	Check to show links between a group and its subordinate(s) group on the 2D map.
Lock Map Scale	<p>Locks the map scale to one of the following, and prevents scrolling in / out when the 2D map is opened in C2 mode:</p> <ul style="list-style-type: none"> • 1:2500 • 1:5000 • 1:10000 • 1:25000 <p>Default setting is unchecked (disabled). Active only at run-time. Works for single or multiplayer scenarios.</p>

2.1.2 Icons Tab

The settings on this tab are used by the Administrator / Instructor to control the entity icons that users see on the 2D map in C2 mode. The tab is divided into two sections. Settings in the upper section are used to show / hide icons for various types of entities, settings in the lower section ([Units Shown on the 2D Map \(below\)](#)) are used to control icons to simulate FoW.



The upper section of the Icons tab has the following settings (the boxes are usually unchecked (settings disabled) by default).

Setting	Description
Show Empty Vehicles	Select to show C2 mode users all empty vehicles on the map.
Show Dead Vehicles and Units	Select to show C2 mode users all dead vehicles and units on the map.
Show Side of Empty Vehicles	Select to show C2 mode users which side empty vehicles are on. Their icons appear on the 2D map as semi-opaque.
Show Side of Dead Vehicles and Units	Select to show C2 mode users which side dead units / vehicles are on. Their icons appear on the 2D maps as semi-opaque.

Units Shown on the 2D Map

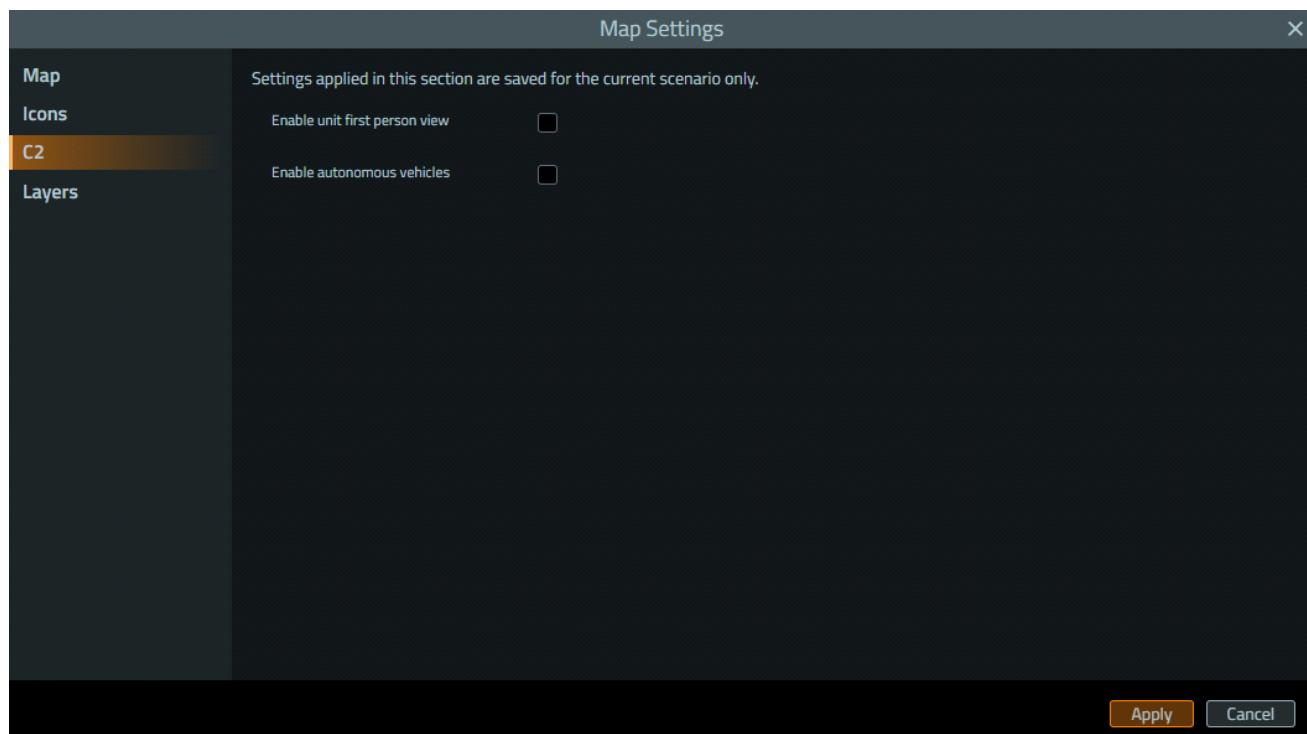
The lower section of the Icons tab has the following FoW settings, which determine what players see on the 2D map in C2 mode.

Setting	Description
For BLUFOR Side	<p>Sets what BLUFOR players see on the 2D map in a scenario.</p> <ul style="list-style-type: none"> • No Entities - No entities are shown on the map. • All - All entities on the map are visible, regardless if they are in the line-of-sight of the player or not. • Only Those on Player's Side - Only entities on the same side are visible. • Only Those on Player's Side, or in his line of sight - Only entities in the line-of-sight of the player, or on the same side, are visible. • Visible to Player's Side - All entities on the same side as the player, units of other sides (providing that they are in the line-of-sight of the player), or anyone else on their side are visible. • Units in Line of Sight - All entities in the line-of-sight of the player (regardless of side) are visible. • Player Only - The player only sees themselves. • Orbat (Default) - All entities in the line-of-sight of the player (regardless of side), and all entities within the player Higher Echelon are visible. <p>In addition, all entities on the same side as the player are listed in the ORBAT List, regardless if they are in the line-of-sight of the player or not).</p>
For OPFOR Side	<p>Sets what OPFOR players see on the 2D map in a scenario.</p> <ul style="list-style-type: none"> • No Entities - No entities are shown on the map. • All - All entities on the map are visible, regardless if they are in the line-of-sight of the player or not. • Only Those on Player's side - Only entities on the same side are visible. • Only Those on Player's Side, or in His Line of Sight - Only entities in the line-of-sight of the player, or on the same side, are visible. • Visible to Player's Side - All entities on the same side as the player, units of other sides (providing that they are in the line-of-sight of the player), or anyone else on their side are visible. • Units in Line of Sight - All entities in the line-of-sight of the player (regardless of side) are visible. • Player Only - The player only sees themselves. • Orbat (Default) - All entities in the line-of-sight of the player (regardless of side), and all entities within the player Higher Echelon are visible. <p>In addition, all entities on the same side as the player are listed in the ORBAT List, regardless if they are in the line-of-sight of the player or not).</p>
Time to Fade	<p>When a unit moves away from another entity, this is the time before the icon of the entity fades away and, possibly, disappears altogether.</p> <p>Enter a number (in seconds) in the box, or use the slider to adjust.</p>
Stop Fading At 50%	<p>Related to the Time to Fade setting.</p> <p>Check to stop icon fading at 50%.</p>

2.1.3 C2 Tab

The settings on this tab allow Administrators / Instructor to enable / disable specific behavior for users in the 3D View in C2 mode.

Image-2: C2 Tab



Setting	Description
Enable Unit First Person View	Select to enable access to the Player Camera view of any BLUFOR unit in the scenario.
Enable Autonomous Vehicles	Select to enable anyone to access Assign To in the context menu, and link AVs to units.

2.1.4 Layers Tab

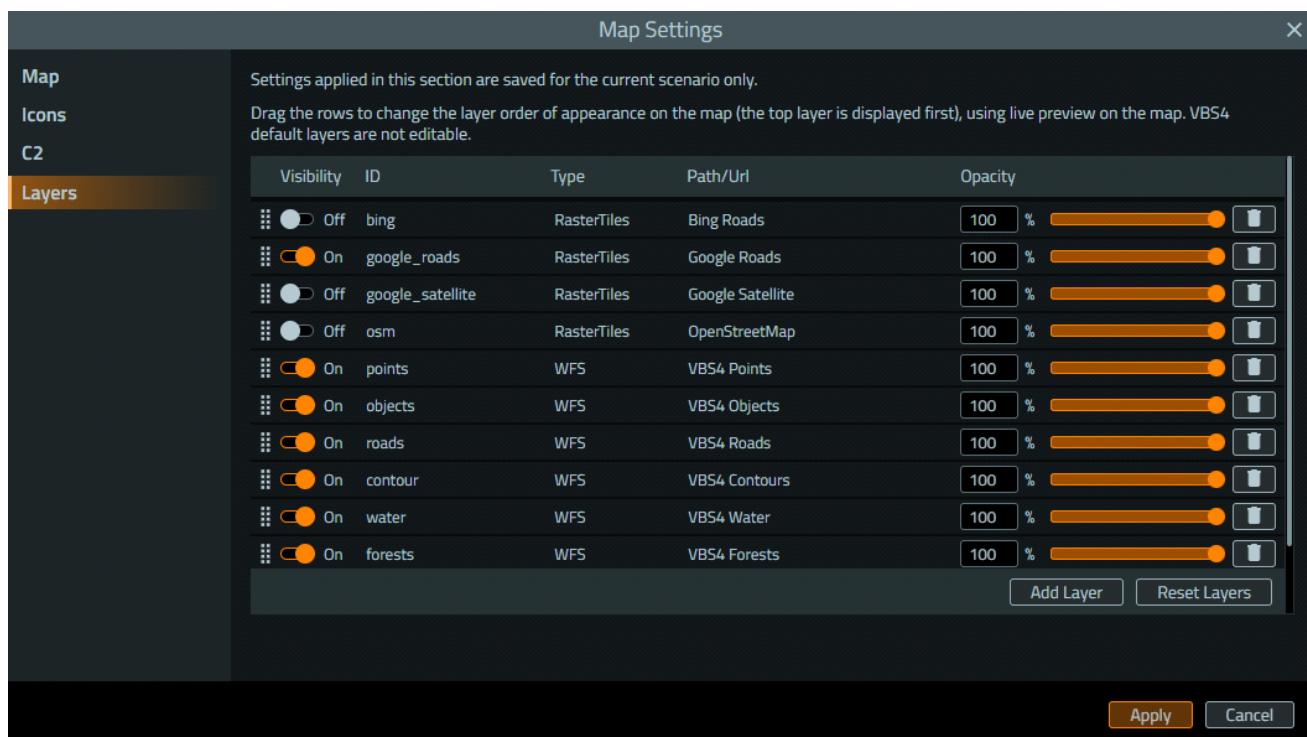
The settings on this tab allow Administrators / Instructors to add map layers.

NOTE

The following considerations apply:

- While map layers are normally set up by Administrators / Instructions, Trainees can override the setup by accessing the Map Settings in the C2 (see Command and Control (C2) Screen in the VBS4 Trainee Manual).
- Certain map layers, such as Microsoft Bing Maps, Google Maps, or OpenStreetMap (OSM), require an unrestricted internet connection, with access to the applicable third-party servers, to be displayed. Some layers may require additional access permission from the relevant vendors.

Image-3: Layers Tab



For more information, see Custom Map Layers.

To export the currently visible region of the map as a [.pdf](#) file or QGIS project ([.qgs](#) file), see Map Export in the VBS4 Editor Manual.

To convert raster map files using QGIS, see Converting Raster Map Files in the VBS4 Editor Manual.

2.2 Commander Machine Interface (CMI) Editor Object

The Commander Machine Interface (CMI) Editor Object allows commanders to display land-vehicle status information for all vehicles in a convoy.

NOTE

The CMI only displays the status information for:

- Vehicles in the player group.
- Vehicles assigned to the player.

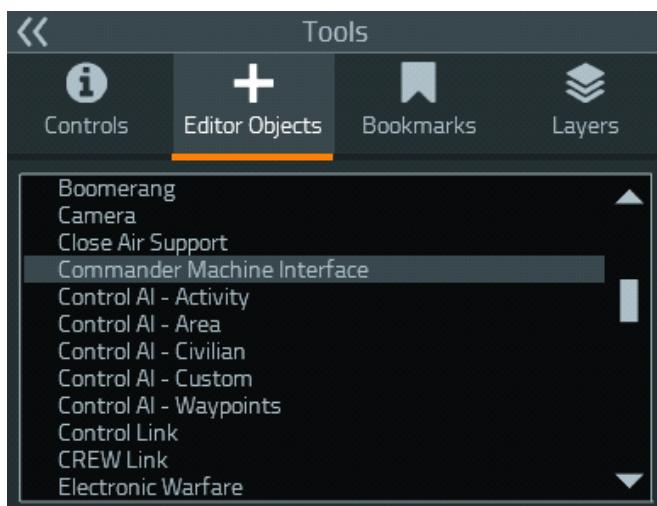
For information on how to use the CMI in the simulation, see [Using the Commander Machine Interface \(CMI\) \(on page 54\)](#).

Follow these steps:

1. Place a vehicle on the map for which you want to add the CMI.

For more information, see Adding Vehicles in the VBS4 Editor Manual.

2. In the Editor Objects List, select **Commander Machine Interface**.



3. Double-click a location on the map where you want to place the CMI Editor Object.

The Object Properties dialog opens.

Information	Select the seats the CMI is available for.
Commander	Yes
Driver	No
Gunner	No
Cargo	No
Allow Globally	No

4. Select the vehicle positions for the CMI to be available in, using the **Yes / No** options in the following drop-downs:

- **Commander**
- **Driver**
- **Gunner**
- **Cargo**
- **Allow Globally**

NOTE

Makes the CMI available in the Editor / C2 to all the scenario participants (Administrators / Instructors / Trainees).

5. Right-click the CMI Editor Object, and select **Link to Vehicle** and click the vehicle you want to add the CMI to.

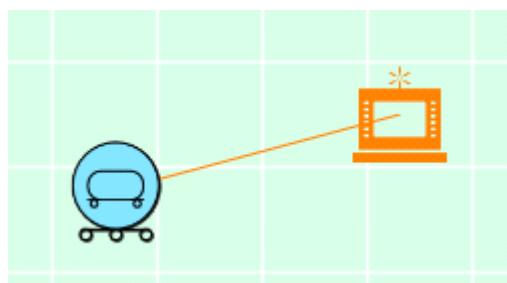
NOTE

This step can be skipped, if **Allow Globally** is selected in the previous step.

WARNING

Linking multiple CMI Editor Objects to the same vehicle is unsupported.

The CMI is added to the vehicle.



3. AV Mission Execution

The most important Editor use case for AVs is the operation and administration of a multiplayer scenario during runtime.

Start a Multiplayer mission and use the VBS Editor to monitor the simulation users, manage the Scenario, and insert simulation objects, hazards, and events.

NOTE

A typical Scenario Execution use case requires a Dedicated Server to host the mission with the Administrator operating an Admin Client on the same network. For more information, see Dedicated Server in the VBS4 Administrator Manual.

Follow these steps:

1. Start a VBS4 instance as an Administrator, together with VBS4 instances for the other users (Commanders, Section Leaders, Trainees).
2. Select your Battlespace in the Battlespaces List, and use the **Execute** function in the Battlespace Functions Panel:
 - Highlight the Scenario name and click **Start**.VBS4 opens the Network Lobby.
3. In the Network Lobby, do the following:
 - a. Assign users to characters, or allow users to select their own.
 - b. **Optional:** Select any of the following:
 - To automatically start recording an After Action Review when the Scenario begins to execute, select **Record AAR**.
 - To skip the Mission Briefing, select **Skip Briefing**.
 - c. Click **OK**.
4. The Mission Starts and displays the Mission Briefing view.

NOTE

The Mission Briefing is skipped if **Skip Briefing** is selected in the Network Lobby.

Once the Mission Briefing is completed, press **OK** to start the mission.

5. Press **Map (M)** or **Pause (Esc)**, and select **Editor** to open VBS Editor in Execute mode.

Do any of the following when the scenario runs:

- Assign and reassign AVs as necessary.

For more information, see [Assigning AV Ownership \(on page 36\)](#).

- Give orders to AVs.

For more information, see [Commanding AVs \(on page 40\)](#).

- As an Administrator, reposition AVs and Waypoints as required if an AV gets stuck.

- Add Waypoints for your AVs to select from.

1. Select (**F3**) **Waypoints** from the Editor Objects List.

2. Place your cursor on the map, and do one of the following:

- Double-click the **LMB**.

- Click the **RMB**, and select **New Object** from the context menu.

The Object Properties dialog opens.

3. In the **Behavior** list, select one of the following Waypoint types: **Convoy**, **UGV Control**, **UGV Control - Defend**.

i **NOTE**

Only these waypoint types can be used with AVs.

4. Set the Waypoint properties, as described in step 3 of [AV Assign Waypoints \(on page 44\)](#).

i **NOTE**

[AV Assign Waypoints \(on page 44\)](#) describes how to create and assign waypoints.

5. Click **OK**.

The Waypoint is placed on the map.

- Change the AV autopilot on AV-enabled vehicles:

- Right-click a single vehicle or group of vehicles on the map, in C2 ORBAT List, or in the Editor Scenario Objects Panel, and select **Autonomous Vehicle > Activate Autopilot / Deactivate Autopilot** to activate / deactivate the AV autopilot.

i **NOTE**

The **Autonomous Vehicles** context menu is not available for Control AI UAVs.

- Use the vehicle Systems Menu.

For more information, see [Activating the AV Autopilot \(on page 51\)](#).

- Switch to Control AI drivers (see **Switch to Unit** in Entity Management in the VBS4 Instructor Manual) in AV-enabled vehicles to take control of their characters.

 **NOTE**

To switch to a Control AI driver, make sure to have the driver unit selected in the Scenario Objects Panel (see the Instructor Interface in the VBS4 Instructor Manual), rather than the vehicle itself.

- Use the DMI / CMI / AV interface.

For more information, see the respective sections:

- [Using the Driver Machine Interface \(DMI\) \(on page 52\)](#).
- [Using the Commander Machine Interface \(CMI\) \(on page 54\)](#).

For more information about the other objects and tools available, see the VBS4 Editor Manual.

4. BISA Interface Overview

VBS4 implements the Battlefield Information Systems Application (BISA) as an extension to the VBS4 Command and Control (C2) interface, with additional UI elements and functionality specific to the Autonomous Vehicle Operations use case , to provide an overview of the scenario as a 2D map, and to interact with AVs.

To access the C2 View, do one of the following:

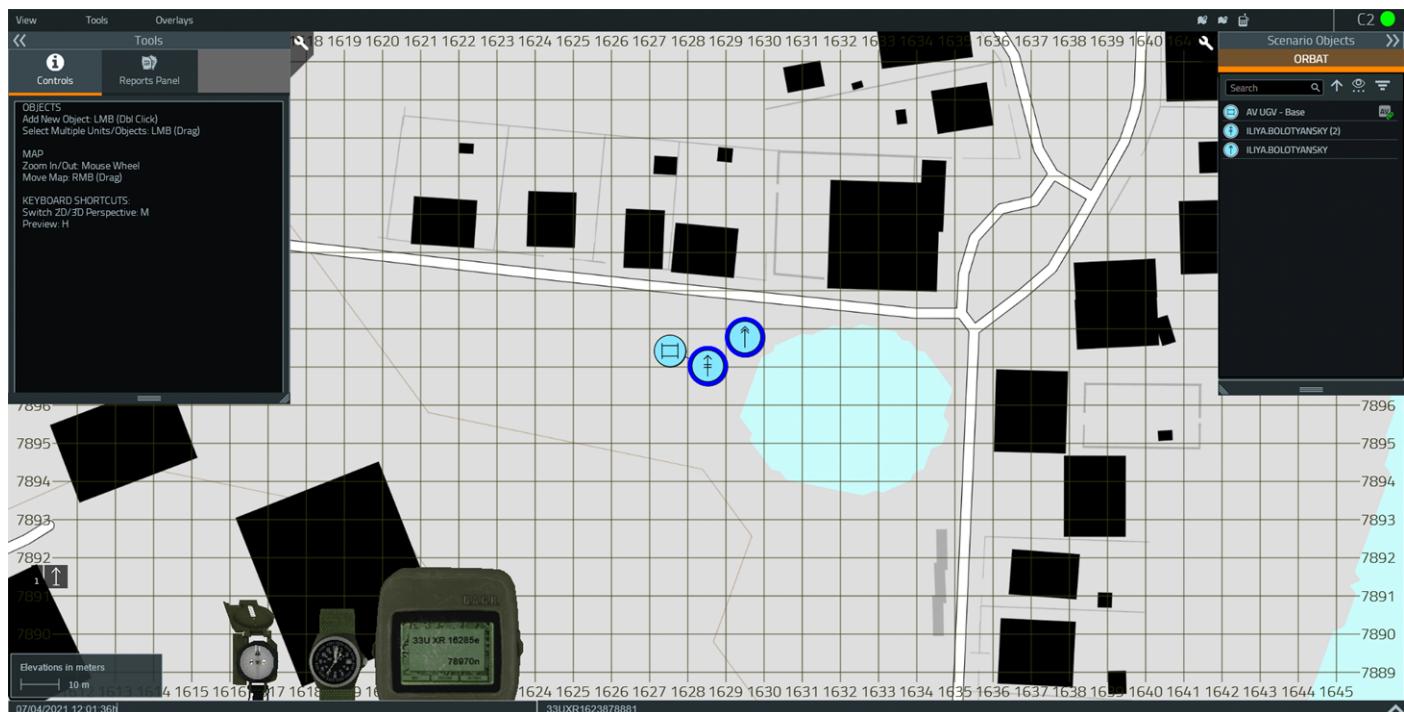
- Press **Pause (Esc)** and select **Command**.
- Press **Map (M)**.

NOTE

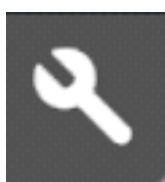
For administrators, pressing **Map (M)** opens Execute mode.

The C2 View opens, displaying a map view of the scenario and a set of panels for AV interaction.

Image-4: C2 UI



If the panels are minimized, click the **Tools** to expand it.



The following BISA controls are available:

- [2D Map View \(below\)](#)
- [Radio Communication \(below\)](#)
- [Reports Panel \(on the next page\)](#)
- [ORBAT List \(on page 33\)](#)
- [BISA Interface Overview \(on the previous page\)](#)
- [Commander Machine Interface \(CMI\) \(on page 35\)](#)

For information about the existing functionality of the C2 View, see Command and Control (C2) Screen in the VBS4 Trainee Manual.

4.1 2D Map View

The 2D Map View provides users with a real-time overview of the scenario, with additional functionality specific to the AV use case:

Use **Editor Camera Zoom In (Num +) / Editor Camera Zoom Out (Num -)**, the **Mouse Scroll Wheel**, or click the map **Zoom In / Zoom Out Icons** in the C2 Toolbar to zoom the map in / out.



Right-click an AV to access the following functionality:

- [Assigning AV Ownership \(on page 36\)](#)
- [Commanding AVs \(on page 40\)](#)

Right-click a Waypoint to access the following functionality:

- [AV Assign Waypoints \(on page 44\)](#) as extensions to existing waypoints.

4.2 Radio Communication

You can use VBS Radio for communication with other players in the scenario.

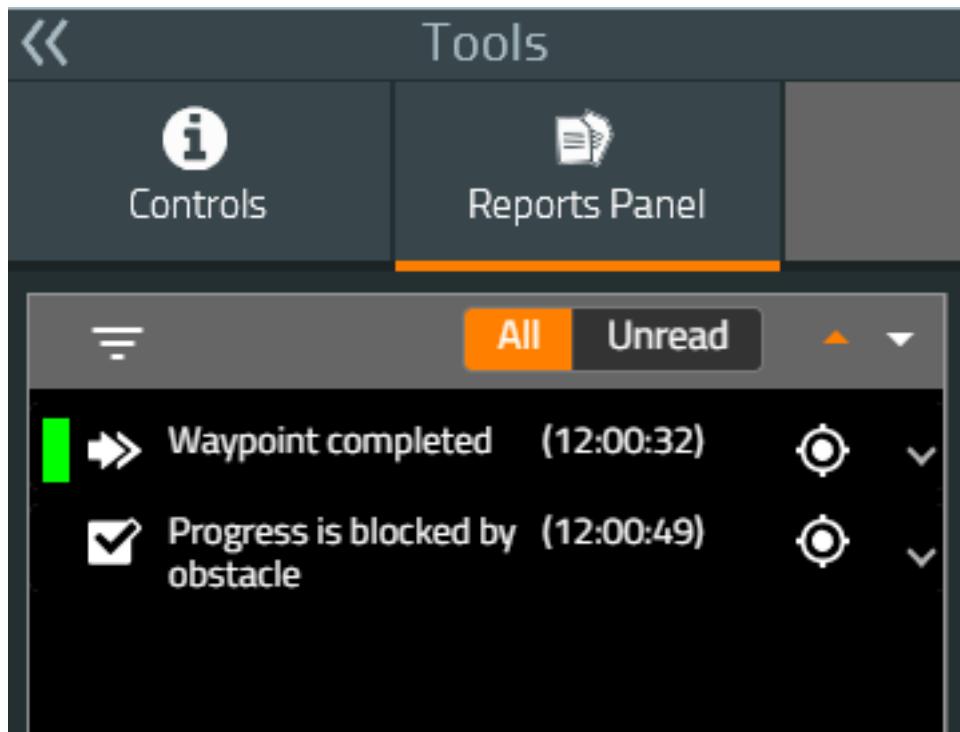
Click the **Radio Icon** in the C2 Toolbar to access the Radio Settings dialog.



For more information, see Using VBS Radio in the VBS Radio Manual.

4.3 Reports Panel

The C2 Tools Panel provides the standard Controls tab displaying the standard C2 controls, and the **Reports Panel** specifically for the AV use case.

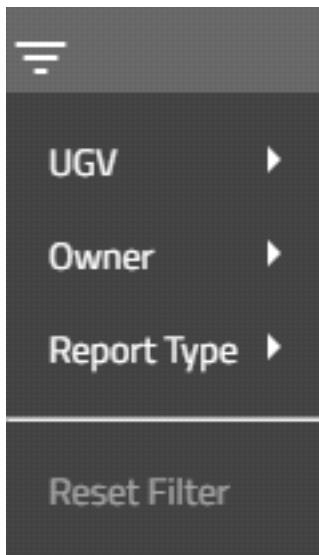


The information displayed depends on your role in the scenario, and the filters applied.

Depending on the rank of the user, the following information is shown in the Reports Panel:

- **Commander** - Information about all AVs in the scenario.
- **Section Leader** - Information about any AVs assigned to their section.
- **Trainee** - Information about any AVs assigned to them.

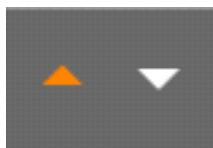
Click the **Filter Icon** and select from the available options to display specific reports.



Click **All** or **Unread** to filter reports based on whether they have already been viewed.



Click the **Up / Down Arrows** to reorder the reports by report time.



Each report includes a summary of the report type, the event time, and a **Location Icon**.



Click the **Expand Icon** to expand and contract report details.

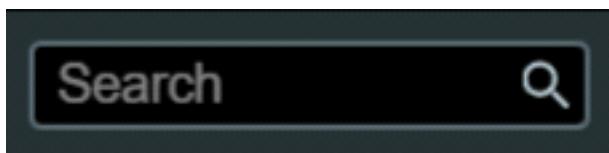


4.4 ORBAT List

The C2 Scenario Objects Panel contains an ORBAT List displaying the command hierarchy of allied groups, units, and AVs.

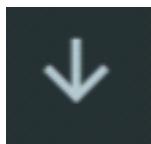


- Use the **Search Bar** to dynamically filter the ORBAT List.



TIP
Search for your Profile Name to find your character in the ORBAT List.

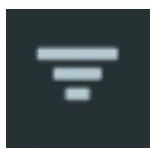
- Click the **Arrow Icon** to expand or contract all ORBAT structures.



- Click the **Expand Icon** to expand and contract an individual ORBAT structure.



- Click the **Filter Icon** to select specific objects types to display within their hierarchy.



- Right-click an AV to assign orders to it. For more information, see [Commanding AVs \(on page 40\)](#).

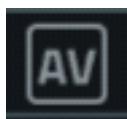
 **NOTE**

Users can only assign orders to AVs that they own.

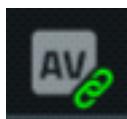
- The AV icons in each AV row indicate whether the AV autopilot is Active / Inactive, and whether the AV is assigned to a unit:



The AV autopilot is Active.



The AV autopilot is Inactive.



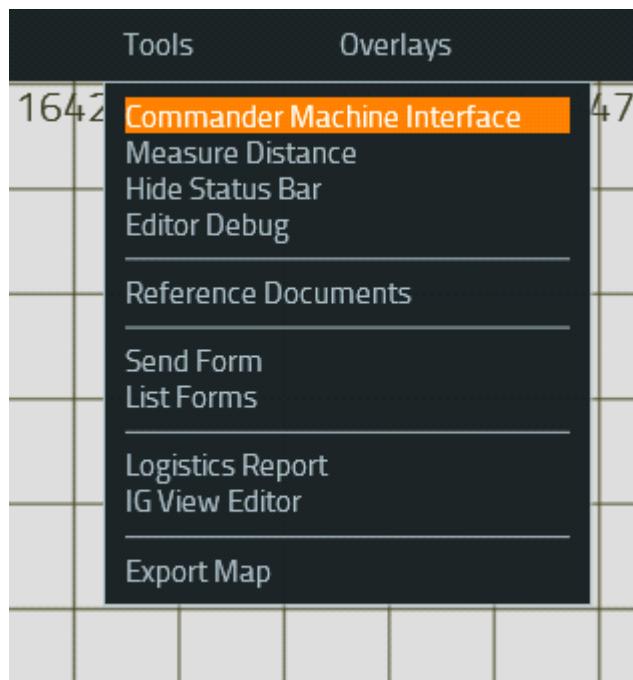
The AV is assigned to a unit.

4.5 Commander Machine Interface (CMI)

Click the **Tools** menu, and select **Commander Machine Interface (CMI)** to open it.

NOTE

In order for the **Commander Machine Interface** option to be available in the **Tools** menu, the CMI Editor Object needs to be enabled globally in the scenario. For more information, see [Commander Machine Interface \(CMI\) Editor Object \(on page 24\)](#).



5. Assigning AV Ownership

Command and control of Autonomous Vehicles is based on assigning ownership to individual users.

- Any user can assign unowned AVs to themselves.
- Commanders can assign AVs to units in sections under their command.
- Section Leaders can assign AVs to members of their section.
- Administrators / Instructors can assign any AV to any user using VBS Editor in Execute mode.
- Only assigned users or Administrators or Instructors can unassign AV ownership.

i **NOTE**

Users do not need to unassign AVs when they are incapacitated in the scenario. VBS4 does it automatically.

- Mouse over the AV on the map, to see whom it is assigned to (displayed as a tooltip).

i **NOTE**

Administrators / Instructors that switch to a different unit still see the old unit name, to whom the AV was originally assigned.

The following is discussed:

- [Assigning Single AVs \(below\)](#)
- [Assigning AV Groups \(on page 38\)](#)

5.1 Assigning Single AVs

You can assign / unassign single AVs to users.

i **NOTE**

This method of assignment / unassignment also works for AV groups. Alternatively, you can use [Assigning AV Groups \(on page 38\)](#).

Follow these steps:

1. Right-click the AV, and select **Autonomous Vehicle > Assign To**.

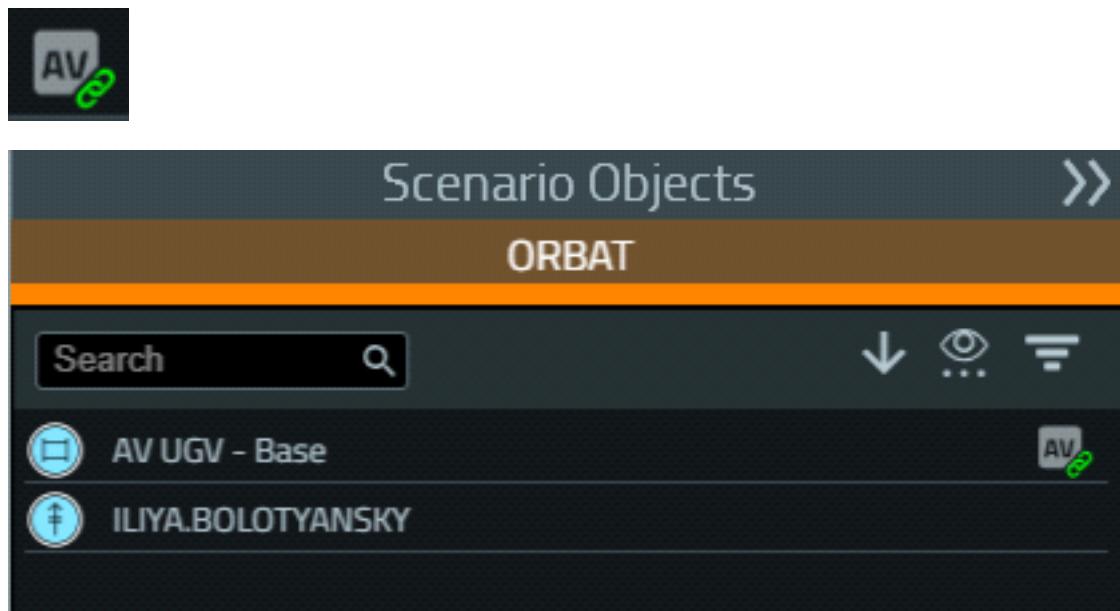
A black arrow is attached to your cursor.

2. Click the **unit** or **vehicle** to assign the AV to.

The following rules apply:

- If the user assigns to a vehicle they are in, they get the ownership.
- If the vehicle has a single crew member, that crew member gets the ownership.
- If the vehicle has several crew members, the commander gets the ownership.

The AV is assigned to the unit, showing the Assignment Indicator in the ORBAT List.



The unit can now control the AV. For more information, see [Commanding AVs \(on page 40\)](#).

When an AV is assigned, no-one else can control the AV.

An AV or an AV group (see [Assigning AV Groups \(on the next page\)](#)) can be unassigned by its controller or the Administrator / Instructor.

Follow these steps:

1. Right-click the **AV**, and select **Autonomous Vehicle > Assign To**.

A black arrow is attached to your cursor.

2. Left-click an empty area in the terrain to unassign the AV.

NOTE

Administrators can directly reassign the AV by clicking another unit using VBS Editor, and Trainees can do the same using the C2 (see [BISA Interface Overview \(on page 29\)](#)).

The AV is unassigned.

5.2 Assigning AV Groups

You can assign AV groups to users.

Follow these steps:

1. Group the AVs using the **Orders > Group With** option - see Creating and Adding to Groups with Links in the VBS4 Editor Manual:

i NOTE

If the AVs are already grouped and you want to transfer the AV group ownership, skip this step.

The AVs are grouped together.

i NOTE

Any non-Control AI units / vehicles are ignored.

2. Right-click any of the grouped AVs or the AV group marker and select **Autonomous Vehicle > Assign To**.

A black arrow is attached to your cursor.

3. Click the **unit** or **vehicle** to assign the AV group to.

i NOTE

If you click a group marker instead of a specific unit or vehicle, the AV group is always assigned to the group leader.

The following rules apply:

- If the user assigns to a vehicle they are in, they get the ownership.
- If the vehicle has a single crew member, that crew member gets the ownership.
- If the vehicle has several crew members, the commander gets the ownership.

The AV group is assigned to the unit, showing the Assignment Indicator in the ORBAT List.



Scenario Objects >>

ORBAT

Search 

↓ ⚡ ⌂

- ▼  1-1-A-1
 -  AV UGV - ATGW 
 -  AV UGV - Base 
 -  AV UGV - C-Bty 
-  ILIYA.BOLOTYANSKY

The unit can now control the AV group. For more information, see [Commanding AVs \(on the next page\)](#).

6. Commanding AVs

Instructors and Trainees interact with AVs from the C2 View.

NOTE

The **Autonomous Vehicles** context menu is not available for Control AI UAVs.

Right-click an AV in the 2D Map, or in the ORBAT List to view the context-sensitive options available to the AV:

- **Autonomous Vehicle > Manual Control**

Assume active control of your assigned AV from a camera view.

NOTE

In order to use manual control on the AV, the **Autopilot** option (see [AV Mission Preparation \(on page 14\)](#)) needs to be set to **Active**.

For other AV controls, see [AV Manual Control \(on page 42\)](#).

- **Camera Views > View Optics**

Assume passive control of your assigned AV with a camera view from the AV.

NOTE

The user has no other control of the AV in this mode.

- **Autonomous Vehicle > Assign To**

Assign and transfer single and group AV ownership. Only available from the 2D Map object context menu.

For more information, see [Assigning AV Ownership \(on page 36\)](#).

- **Autonomous Vehicle > Change Current Behavior**

Select to modify the current behavior.

For more information, see [AV Assign Waypoints \(on page 44\)](#).

- **Autonomous Vehicle > Follow Callsign**

Select to order the AV to follow a callsign.

For more information, see [Follow Callsign \(on page 49\)](#).

- **Orders > Assign New Waypoint**

Give an order to your assigned AV to perform a specific behavior.

For more information, see [AV Assign Waypoints \(on page 44\)](#).

- **Orders > Order Fire Support**

Available on AVs equipped with weapons, order the AV to provide fire support in the target area, see Fire Support in the VBS4 Instructor Manual.

- **Autonomous Vehicle > Activate Autopilot / Deactivate Autopilot**

Activate / deactivate the AV autopilot on a single vehicle or a group of vehicles.

 **NOTE**

Any AV-enabled vehicle driver (not necessarily a commander) can activate / deactivate the AV autopilot using the Systems Menu. For more information, see [Activating the AV Autopilot \(on page 51\)](#).

6.1 AV Manual Control

You can take active control of AVs assigned to you.

NOTE

In order to use manual control on the AV, the **Autopilot** option (see [AV Mission Preparation \(on page 14\)](#)) needs to be set to **Active**.

Follow these steps:

1. In the C2 View, right-click an assigned AV in the 2D Map or ORBAT List, and select **Autonomous Vehicle > Manual Control**.

VBS4 switches to a camera view from the AV.

2. Control the AV using the standard controls for the vehicle type:

For more information, see the appropriate topic in the VBS4 Trainee Manual:

- Land Vehicle Controls, to control AVs and UGVs.
- Rotary Wing Aircraft Controls, to control UAVs.
- Vehicle Weapon Controls, to control weapon systems and cameras.

3. Press **Systems Menu (Y)** to control camera feeds.

4. **Multiple Camera Feeds**

You can view multiple camera feeds simultaneously on UGVs equipped with multiple cameras.

Select **Cameras > Cameras > Camera Feed**, where **Camera Feed** is any of the available camera feeds to show / hide.

Image-5: Left, Right, and Rear Center camera feeds



5. Wide Field Of View (WFOV) Cameras

You can use the Wide Field of View (WFOV) on UGVs equipped with WFOV cameras (see [Autonomous Vehicles List \(on page 8\)](#)):

Select **Cameras > Show WFOV / Hide WFOV** to show / hide the WFOV Heads Up Display (HUD).

Image-6: WFOV camera view



6. Press **Quick Menu (Left Windows)**, choose the **VEHICLE** category, and select any of the available options to perform context-specific actions for the vehicle.
7. Press **Quick Menu (Left Windows)**, choose the **VEHICLE** category, and select **EXIT MANUAL CONTROL / EXIT ROBOT / EXIT UAV**, to leave manual control and return to the C2 View.

6.2 AV Assign Waypoints

You can give more complex orders to AVs by assigning waypoints. The options vary according to the AV type.

NOTE

You can assign waypoints to a single AV or an AV group. For more information, [Assigning AV Ownership \(on page 36\)](#).

Follow these steps:

1. In the C2 View, right-click your assigned AV in the 2D Map or ORBAT List, and select **Orders > Assign New Waypoint**.

A black line with an arrow attaches to the AV.

2. Click a location on the map, where you want to place the waypoint.

The Waypoint Object Properties panel opens.

3. Set the waypoint behaviors based on the vehicle type and objective:

- For UAVs, use standard VBS4 waypoint behaviors.

For more information, see Fly Order, Loiter Order, Land Order, and Waypoints in the VBS Control AI Manual.

- To move UGVs or Land AV-enabled vehicles or use them to defend a location, set the [UGV Control / UGV Control - Defend / Autopilot - Defend Parameters \(on the next page\)](#).
- To move UGVs or Land AV-enabled vehicles as a convoy, set the [Convoy Parameters \(on page 46\)](#).

4. Set the [Order Waypoint Completion Parameters \(on page 48\)](#).

5. Click **OK**.

The waypoint is set and appears on the map.

The AV performs the selected behavior. The [Reports Panel \(on page 31\)](#) indicates when the AV completes the Waypoint.

While an AV is performing the behavior, you can do any of the following:

- Right-click the **Waypoint**, and select **Edit Object** to change its settings.
- Drag-and-drop a waypoint in the map to move it.
- Right-click the **AV** in the 2D map or the ORBAT List, and select **Autonomous Vehicle > Change Current Behavior** to change the current waypoint settings.

- Right-click the AV in the 2D Map or ORBAT List, and repeat the procedure to apply a new behavior.

The AV stops the current behavior and starts the new one. The current waypoint remains on the map.

- Right-click the Waypoint, select **Assign Next Waypoint**, and repeat the procedure to create a set of linked waypoints.

The AV completes the initial behavior and then performs the next one.

UGV Control / UGV Control - Defend / Autopilot - Defend Parameters

Object Property	Description
Behavior	<p>Select UGV Control / UGV Control - Defend / Autopilot - Defend.</p> <ul style="list-style-type: none">UGV Control - Used to order UGVs to move to a certain location.UGV Control - Defend - Used to order a single UGV to move to a location and defend in a specific direction.Autopilot - Defend - Used to order a single Land AV-enabled vehicle to move to a location and defend in a specific direction.
NOTE UGV Control - Defend and Autopilot - Defend can only be assigned to individual (ungrouped) UGVs.	
Road Usage	<p>Controls whether the AV should use roads for moving.</p> <ul style="list-style-type: none">Ignore Roads - AV ignores roads (drives off the road) and moves directly to the waypoint.Use Only Roads - AV drives in the middle of the road, without respecting any road lanes or directions.Use Only Roads, Respect Lanes - AV drives on the road, respecting the road lanes and directions. Also, see Multi-Lane Traffic (on page 48).Prefer Roads - AV prefers to move on the road, but can move off-road to bypass obstacles, take shortcuts, or when otherwise required.
NOTE An off-road AV cannot drive through areas with a high density of obstacles.	
Avoid Threats	Select whether the AV should avoid enemies and specific threat markers.

Object Property	Description
Weapon Control Status	Select the firing behavior for the AV. <ul style="list-style-type: none"> Weapons Free - Fire at enemy forces, when they are encountered. Hold Fire - Do not fire at enemy forces, when they are encountered. Return Fire - Only fire at enemy forces, when they are encountered, if they fire first.
Movement Speed (km/h)	Input the maximum speed (in km/h) for the AV.
Delay (s)	Input a delay time before the AV starts the behavior.
Halt on Detect	If set to Yes , the AV stops moving when it detects anything it considers to be hostile.
Formation	Used in UGV convoys to define the convoy formation.
<p>NOTE Only applies to the UGV Control behavior.</p>	
<p>The available formations are:</p> <ul style="list-style-type: none"> Convoy (parallel to the direction of the convoy movement) Staggered Column Line (perpendicular to the direction of the convoy movement) Wedge Vee 	
Variable Name	Order waypoint variable name, which can be used in SQF scripts. The variable name is used in the Select Waypoint control in the DMI (see Using the Driver Machine Interface (DMI) (on page 52)).

Convoy Parameters

Object Property	Description
Behavior	Select Convoy .
<p>NOTE The Convoy behavior does not get reported in the Reports Panel (on page 31) on waypoint completion.</p>	
Description	Convoy waypoint name. The waypoint name is used in the Select Waypoint control in the DMI (see Using the Driver Machine Interface (DMI) (on page 52)).

Object Property	Description
Vehicle Spacing (m)	Desired spacing (in meters) between the vehicles in the convoy.
Movement Speed (km/h)	Suggested travel speed (in km/h) of the convoy (limited by the vehicle with the smallest maximal speed and / or the smallest acceleration).
On Visual Contact	Controls how the convoy reacts when spotting the enemy. <ul style="list-style-type: none"> Continue, Hold Fire (default) - Convoy continues moving towards the destination and gunners do not fire at the enemy. Continue, Open Fire - Convoy continues moving towards the destination and gunners open fire at enemy entities.
On Taking Fire	Controls how the convoy reacts to incoming enemy fire (defined by shots impacting or passing around the convoy at a short distance) - this setting has a higher priority than On Visual Contact . <ul style="list-style-type: none"> Continue, Hold Fire - Convoy continues moving towards the destination and gunners do not fire at enemy entities. Continue, Open Fire (default) - Convoy continues moving towards the destination and gunners open fire at enemy entities. Halt Until Clear, Open Fire - Convoy stops while the gunners open fire at the enemy. The convoy automatically resumes its movement as the engagement is concluded.
Road Usage	Controls whether the AV should use roads for moving. <ul style="list-style-type: none"> Ignore Roads - AV ignores roads (drives off the road) and moves directly to the waypoint. Use Only Roads - AV drives in the middle of the road, without respecting any road lanes or directions. Use Only Roads, Respect Lanes - AV drives on the road, respecting the road lanes and directions. Also, see Multi-Lane Traffic (on the next page). Prefer Roads - AV prefers to move on the road, but can move off-road to bypass obstacles, take shortcuts, or when otherwise required.

NOTE

An off-road AV cannot drive through areas with a high density of obstacles.

Object Property	Description
Formation	<p>Used to define the convoy formation.</p> <p>The available formations are:</p> <ul style="list-style-type: none"> • Convoy (parallel to the direction of the convoy movement) • Staggered Column • Line (perpendicular to the direction of the convoy movement) • Wedge • Vee
Advanced	<p>The advanced settings are:</p> <ul style="list-style-type: none"> • Burst - Sets the number of rounds fired in each burst by the convoy gunners during an engagement. • Dispersion (degrees) - Sets the dispersion of convoy weapons, allowing you to decrease / increase convoy weapon accuracy. • Visibility Range (m) - Can override the default line-of-sight settings for each soldier, allowing you to increase / decrease visual contact reaction distance. <p>Click OK to confirm.</p>
Variable Name	<p>Order waypoint variable name, which can be used in SQF scripts.</p> <p>The variable name is used in the Select Waypoint control in the DMI (see Using the Driver Machine Interface (DMI) (on page 52)).</p>

Order Waypoint Completion Parameters

Set the Order waypoint completion settings:

Option	Description
Condition to Complete	Condition that needs to be fulfilled to complete the waypoint for the selected Order behavior.
Code on Completion	SQF code to execute on waypoint completion.

Multi-Lane Traffic

For multi-lane traffic, if **Use Only Roads, Respect Lanes** is used, you can either use the **AI Debug** option in VBS Geo (see VBS Geo User Interface in the VBS Geo Manual), or the **Show Roads** and **Generate Roads** options in the AI Debug Panel (see Control AI Visualization in the VBS Control AI Manual), to see how your road network is set up. Also, to configure road lanes, see **Lanes** in Placing and Editing Roads in the VBS Geo Manual.

6.3 Follow Callsign

Follow Callsign is a function that is available to UGVs (or other Land AV-enabled vehicles) and UAVs that are assigned to callsigns, such as units. Usually, UGVs / UAVs are given waypoints to move around, but when Follow Callsign is invoked, normal waypoint behavior is overridden, and the UGV / UAV follows the callsign wherever it goes.

The Follow Callsign function has the following characteristics and limitations:

- It is activated by the administrator in VBS Editor (Execute Mode), or an assigned user in C2.
- If you delete a waypoint, while a UGV / UAV executes Follow Callsign on a certain unit, you need to apply Follow Callsign twice to that unit, to be able to execute it again.
- If the callsign stops, the UGV stops and the UAV stops in midair. When the callsign starts moving again, so does the UGV / UAV.
- If the callsign enters a building, the UGV waits outside until the callsign comes out.
- The UGV / UAV retains a distance from the callsign of approximately 10 meters (UAVs can follow at higher altitude, but need to retain a 2D distance of approximately 10 meters), unless Follow Callsign is disabled. If the callsign enters a building, the UGV stops and the distance is not retained.
- UGVs cannot pass through smaller gaps (for example, between gate posts, market stalls). They continue to follow the callsign, but by the nearest possible route.
- When Follow Callsign is enabled, the waypoint settings have no effect for the UGV driver, who ignores the waypoint. However, the **Rules of Engagement** and **Defend on Completion** settings do have an effect for the gunner.
- UAVs do not use collision avoidance.
- UAVs do not take off when positioned too close to the callsign.
- Assigning multiple UAVs to the same callsign is unsupported.
- Assigning waypoints while UAVs execute Follow Callsign may result in unexpected behavior. To assign waypoints, disable Follow Callsign first (see [Disabling Follow Callsign \(on the next page\)](#)).
- For UAVs, the Follow Callsign waypoint Combat Mode is set to **Never Fire**, the Behavior to **Careless**, and the threat path is disabled, to prevent the UAV from flying away from the enemy and ignoring the Follow Callsign order.

Image-7: Follow Callsign function in VBS4



Follow these steps:

1. Assign a **UGV / UAV** to a unit - see [Assigning AV Ownership \(on page 36\)](#).
2. Right-click the UGV / UAV, and select **Autonomous Vehicle > Follow Callsign** in the context menu.

NOTE

The **Autonomous Vehicles** context menu is not available for Control AI UAVs.

A black arrow is attached to your cursor.

3. Click the callsign, which can be a human, a vehicle entity, or a group (the group leader is followed), you want the UGV / UAV to follow.

The UGV / UAV turns towards the callsign and follows it.

Disabling Follow Callsign

To disable Follow Callsign, right-click the UGV / UAV, select **Autonomous Vehicle > Follow Callsign**, and click an empty area on the map; or delete the Follow Callsign waypoint from the map.

NOTE

Deleting the Follow Callsign waypoint only applies to UGVs, not UAVs.

7. Activating the AV Autopilot

During a simulation, you can activate / deactivate the AV autopilot on an AV-enabled vehicle (for information on how to make a vehicle AV-enabled, see [AV Mission Preparation \(on page 14\)](#)) using the Systems Menu (see Systems Menu in the VBS4 Trainee Manual).

NOTE

As an alternative, you can also activate the AV autopilot using the DMI (see [Using the Driver Machine Interface \(DMI\) \(on the next page\)](#)).

Follow these steps:

1. Make sure you are in the driver position of the AV-enabled vehicle.

For information about how to access the driver position in the simulation, see [Interact with Vehicles Interface \(IWF\) in the VBS4 Trainee Manual](#).

2. Press **Systems Menu (Y)**.

The AV Systems Menu opens.



3. Click the **LMB** (or press the corresponding menu numbers) to select **Vehicle Interfaces > Activate Autopilot**.

The AV autopilot is activated.

To deactivate the AV autopilot, select **Vehicle Interfaces > Deactivate Autopilot** in the Systems Menu.

TIP

To take control of the vehicle as its driver, you can either:

- Use the standard movement controls listed in [Vehicle Controls in the VBS4 Trainee Manual](#).
- Deactivate the AV autopilot.

8. Using the Driver Machine Interface (DMI)

Land-vehicle drivers can use the Driver Machine Interface (DMI) to control the vehicle.

i NOTE

To enable the DMI, the vehicle has to be AV-enabled and use the Autopilot mode, which needs to be set to **Active**. For more information, see [AV Mission Preparation \(on page 14\)](#).

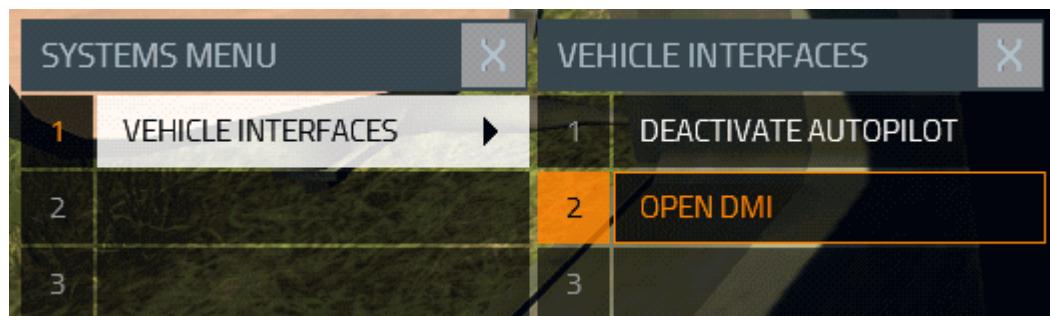
Follow these steps:

1. Make sure you are in the driver position of the AV-enabled vehicle.

For information about how to access the driver position in the simulation, see [Interact with Vehicles Interface \(IWF\) in the VBS4 Trainee Manual](#).

2. Press **Systems Menu (Y)**.

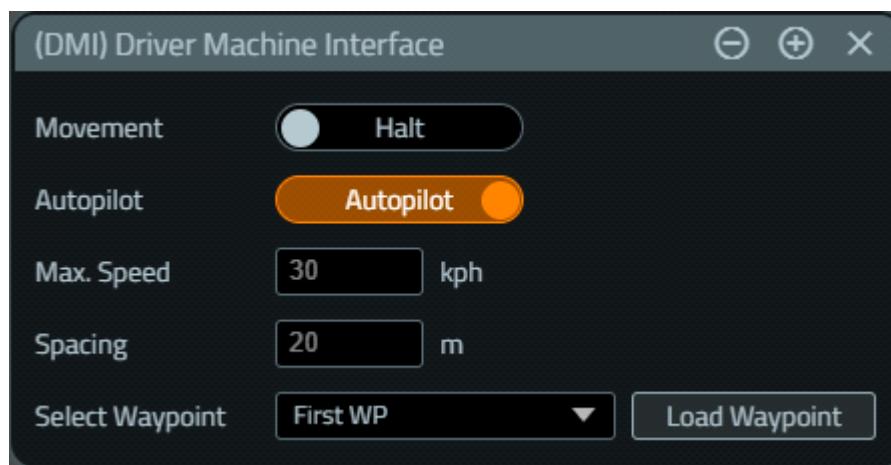
The AV Systems Menu opens.



3. Click the **LMB** (or press the corresponding menu numbers) to select **Vehicle Interfaces > Open DMI**.

The DMI panel opens.

To close the DMI, select **Vehicle Interfaces > Close DMI** in the Systems Menu, or click **X** in the DMI panel.



Use the following DMI controls:

Control	Description
Interaction Toggle	Press LAlt to toggle the interaction between the DMI panel and the rest of VBS4.
Plus / Minus / Close	Use the Plus / Minus icons to increase / decrease the DMI panel size.   Use the Close icon to close the DMI panel. 
Movement	Use the slider to either halt the vehicle, or allow it to drive. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;">NOTE<p>Works only when the Autopilot mode is set to Active, and does nothing when the player drives the vehicle manually.</p></div>
Autopilot	Switch the Autopilot mode on / off.
Max. Speed	Set the maximum allowed speed for the vehicle, in kilometers per hour.
Spacing	Set the distance (in meters) between the preceding and following vehicles, when driving in a convoy. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;">NOTE<p>The spacing only applies to the vehicle for which it is set, and not to all the vehicles in a convoy.</p></div>
Select Waypoint	Use the drop-down to select any of the available waypoints for the vehicle to drive to, and then click Load Waypoint . The waypoint name is based on the Description field used in Convoy waypoints. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;">NOTE<p>The following considerations apply:</p><ul style="list-style-type: none">Only Convoy waypoints can be selected.The selected waypoint applies to the entire convoy group.</div> <p>To add waypoints to select from, see AV Mission Preparation (on page 14) or AV Mission Execution (on page 26), or AV Assign Waypoints (on page 44).</p>

9. Using the Commander Machine Interface (CMI)

Vehicle commanders can use the Commander Machine Interface (CMI), which displays land-vehicle status information for all the vehicles in a convoy.

i NOTE

The CMI only displays the status information for:

- Vehicles in the player group.
- Vehicles assigned to the player.

Depending on where the CMI is available, do one of the following:

i NOTE

The CMI Editor Object needs to be made available in one of the following ways:

- Enabled globally for all player units.
- Linked to the vehicle and enabled for the vehicle position the player occupies.

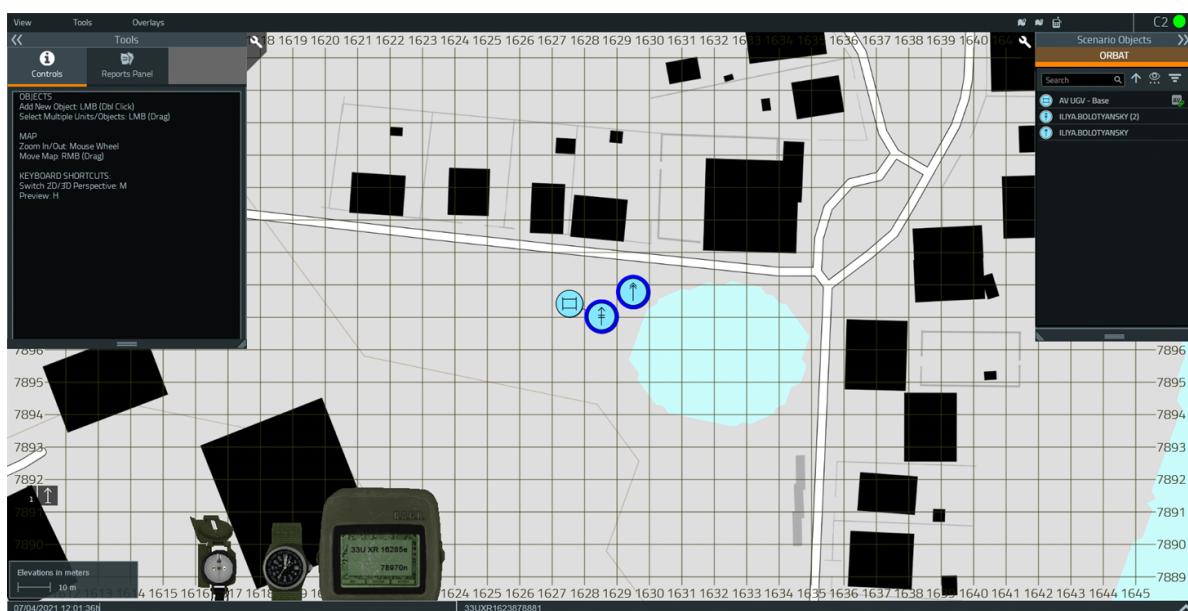
For more information, see [Commander Machine Interface \(CMI\) Editor Object \(on page 24\)](#).

As a player anywhere in the scenario, if the CMI Editor Object is enabled globally:

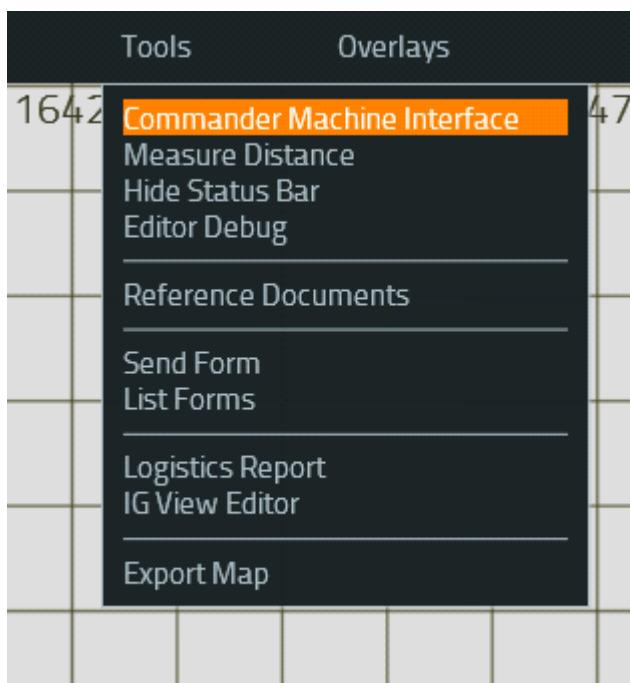
Follow these steps:

1. Press **Pause (Esc)** and select **C2**.

The C2 / BISA interface (see [BISA Interface Overview \(on page 29\)](#)) opens.



2. Open the **Tools** menu, and select **Commander Machine Interface**.



As a player in a vehicle:

Follow these steps:

1. Press **Systems Menu (Y)** to open the Systems Menu.

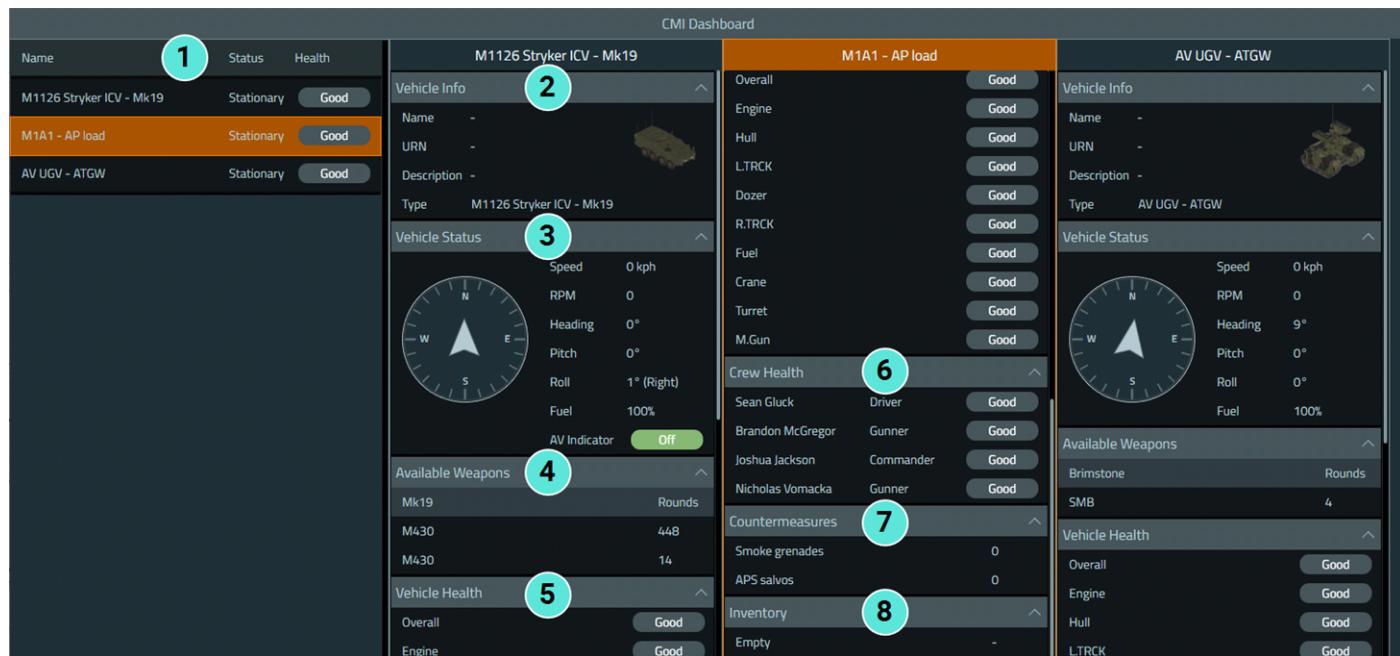
The AV Systems Menu opens.



2. Click the **LMB** (or press the corresponding menu numbers) to select **Vehicle Interfaces > Open CMI**.

The CMI Dashboard opens as a separate application window.

To close the CMI Dashboard, select **Vehicle Interfaces > Close CMI** in the Systems Menu, or click **X** in the CMI Dashboard window.



The CMI contains the following vehicle-status widgets:

Number	Description
1	<p>The Vehicles widget displays the list of convoy vehicles:</p> <ul style="list-style-type: none"> Name - Vehicle name. Status - Movement status. Can be: <ul style="list-style-type: none"> Moving Stationary Health - Health indicator. Can be: <ul style="list-style-type: none"> Good Damaged Destroyed <p>Each convoy vehicle has detailed status information, arranged from left to right horizontally, with specific status widgets belonging to a particular vehicle grouped vertically.</p>

Number	Description
2	The Vehicle Information widget contains the following details: <ul style="list-style-type: none">• Preview Image - Vehicle preview image.• Name - Vehicle name.• URN - Vehicle URN.• Description - Vehicle description.• Type - Vehicle type.
3	The Vehicle Status widget contains the following details: <ul style="list-style-type: none">• Compass - Vehicle compass orientation.• AV Indicator - Indicates whether the vehicle is in AV autopilot (see Activate Autopilot / Deactivate Autopilot in Commanding AVs (on page 40)) is active / inactive / off.• Speed - Vehicle speed (in kph).• RPM - Vehicle Revolutions Per Minute (RPM).• Heading / Pitch / Roll - Vehicle heading / pitch / roll (in degrees).• Fuel - Amount of fuel as a percentage.
4	The Available Weapons widget lists the vehicle weapons and remaining weapon ammunition.
5	The Vehicle Health widget contains indicators for each vehicle component.
<div style="border: 1px solid #0070C0; padding: 10px; margin-bottom: 10px;"><p> NOTE Different vehicles can have different components.</p></div>	
6	<p>The health indicator values are:</p> <ul style="list-style-type: none">• Good• Damaged• Destroyed
7	The Crew Health widget contains indicators for each vehicle crew member.
8	<p>The health indicator values are:</p> <ul style="list-style-type: none">• Good• Damaged• Destroyed
7	The Countermeasures widget lists the available / remaining vehicle Countermeasures (see in the VBS4 Editor Manual and Countermeasures - Smoke in the VBS4 Trainee Manual).
8	The Inventory widget lists the vehicle inventory (Equipment Inventory in the VBS4 Trainee Manual).