



Military Operations

Benchmark

Quick Guide

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System requirements

This Benchmark release targets the following performance numbers:

System	Simulation	Acceleration	Rendering	Quality
Low-end	50k troops, 10K units	1x	30 fps	"Lite"
Mid range	50k troops, 10K units	3x	30 fps	"Standard"
High-end	50k troops, 10K units	7x	30 fps	"Standard"

Minimum system

Currently targeted minimum system requirements.

- Windows 7 or newer (x64)
- Quad core CPU
- 8 GB ram
- 3 GB Video ram
- OpenGL 4.3
- OpenCL 1.2
- 2 TFLOP GPU
- 25 GB free HD space

Recommended system

Medium spec system.

- Windows 10 x64
- Intel i5 equivalent CPU
- 16 GB ram
- 4 GB Video ram
- 4 TFLOP GPU
- 25 GB free HD space

Recommended High-end system

More powerful GPUs support larger OOBs (counts) and acceleration rates.

- Windows 10 x64
- Intel i7 equivalent CPU
- 16 GB ram
- 6 GB Video ram
- 6 TFLOP GPU
- 25 GB free space on a SSD



Installation

The MilOps-Benchmark Tool is currently only distributed through Steam only.

Definitions and conventions

Troops : Physical vehicles, equipment, infantry and other soldiers
Unit : An abstract military entity in the hierarchy
Selected : When the mouse is hovering an interactive item
Activated : When the interactive item was clicked
OOB : Order Of Battle

Introduction

This software can perform a Benchmark test to establish the readiness of your system to run The "Metis Simulation Technology" in general and "Military Operations" games in particular.

The Benchmark tool also allows the user to be a spectator of a battle between 2 opposing forces.

Starting from version 20.4.0 (August 2018), limited game-play elements have been added for testing and sharing game-play ideas with the community. These experimental game-play elements do not represent the final game.

The UI

When starting the application for the first time, an internal code-profiling is performed to determine the optimal settings for running GPU code.

Subsequent runs will not need to repeat this until you change your hardware, update the graphics drivers or Steam installs a new version of MilOps.

Main menu

After starting the application, the main menu is shown.

Quit

Pressing "QUIT", ends the application and returns to the Windows desktop.

Settings

The "SETTINGS" menu allows you to change a number of settings. Most of these can also be changed at any time during roaming.

UI

HUD

Show FPS in upper-left corner

Icon Style

Toggle between NATO or pictogram style icons

Tooltips

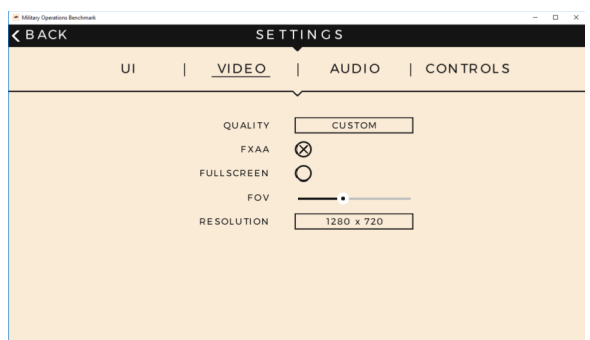
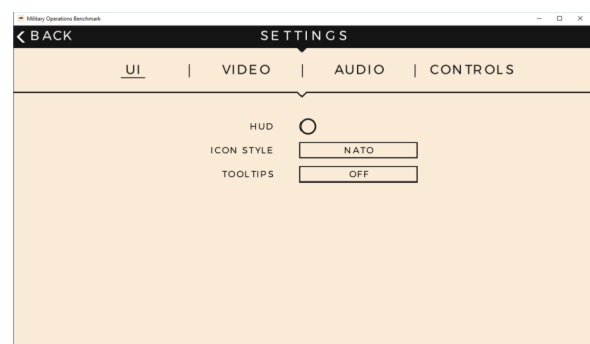
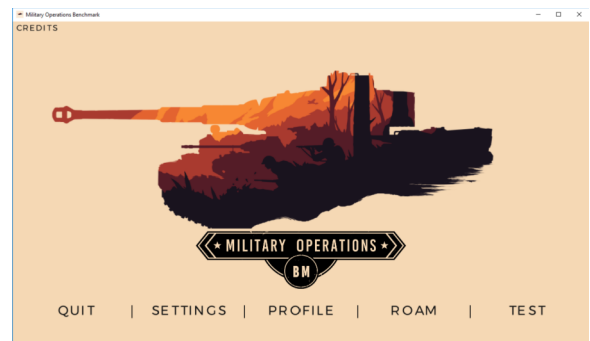
Whether and where to show tooltips

Video

Quality

This setting is only available from the Main menu, not during roaming.

Lite, Standard and High rendering quality pre-sets.



FXAA

Toggle anti-aliasing filtering

Fullscreen

Toggle between Windowed and full screen display

FOV

Change the Field Of View

Resolution

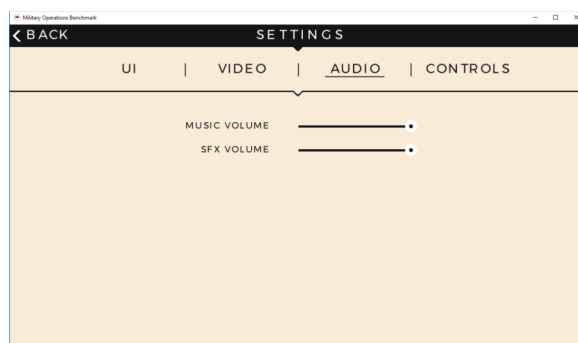
Select a resolution from the drop-down menu

AudioMusic Volume

Slide to select the volume. All the way to the left mutes.

SFX Volume

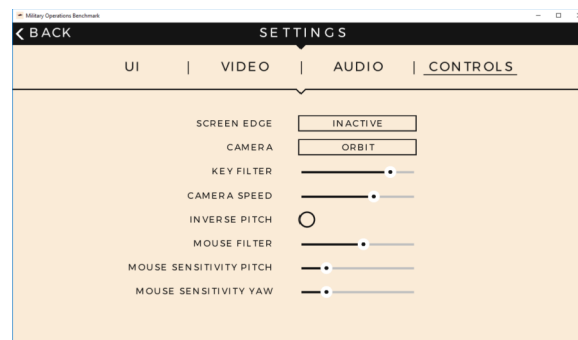
Slide to select the volume. All the way to the left mutes.

**Controls**Screen Edge

Toggle between enabling or disabling triggering camera movement by hovering the mouse near the screen edge.

Camera

Toggle between orbit or air-plane style camera behaviour

Goto Camera

The preferred camera behaviour when Alt-clicking on a unit-icon.

Key Filter

Controls the amount of filtering on the keyboard input for controlling the camera position. More to the right means smoother but less direct input.

Camera Speed

Controls how fast the camera moves.

Inverse Pitch

Controls the behaviour of the mouse up/down vs camera up/down



Mouse Filter

Controls the amount of filtering on mouse input for rotating the camera. More to the right means smoother but less direct input.

Mouse Sensitivity Pitch

Controls how much mouse movement is needed to look up/down

Mouse Sensitivity Yaw

Controls how much mouse movement is needed to look left/right

Profile

Loads a scenario and starts a benchmark run. Goes to Roam-mode after the Benchmark-results screen.

Roam

Goes directly to free-roam mode without Benchmarking first.

In free-roam you have umpire status and you can freely move over the planet. You can not issue any orders.

Test

Loads a scenario and allows you to play with limited functionality.

A number of objectives, represented by "flags" in the environment can be captures from the opposing forces. Play-time is limited to a simulated day-segment. For more information, see the topic "Game-play testing" [21].

Running the application

After selecting "Profile", "Roam" or "Test", a scenario is loaded, and the camera zooms-in to the battle area.

Benchmark results

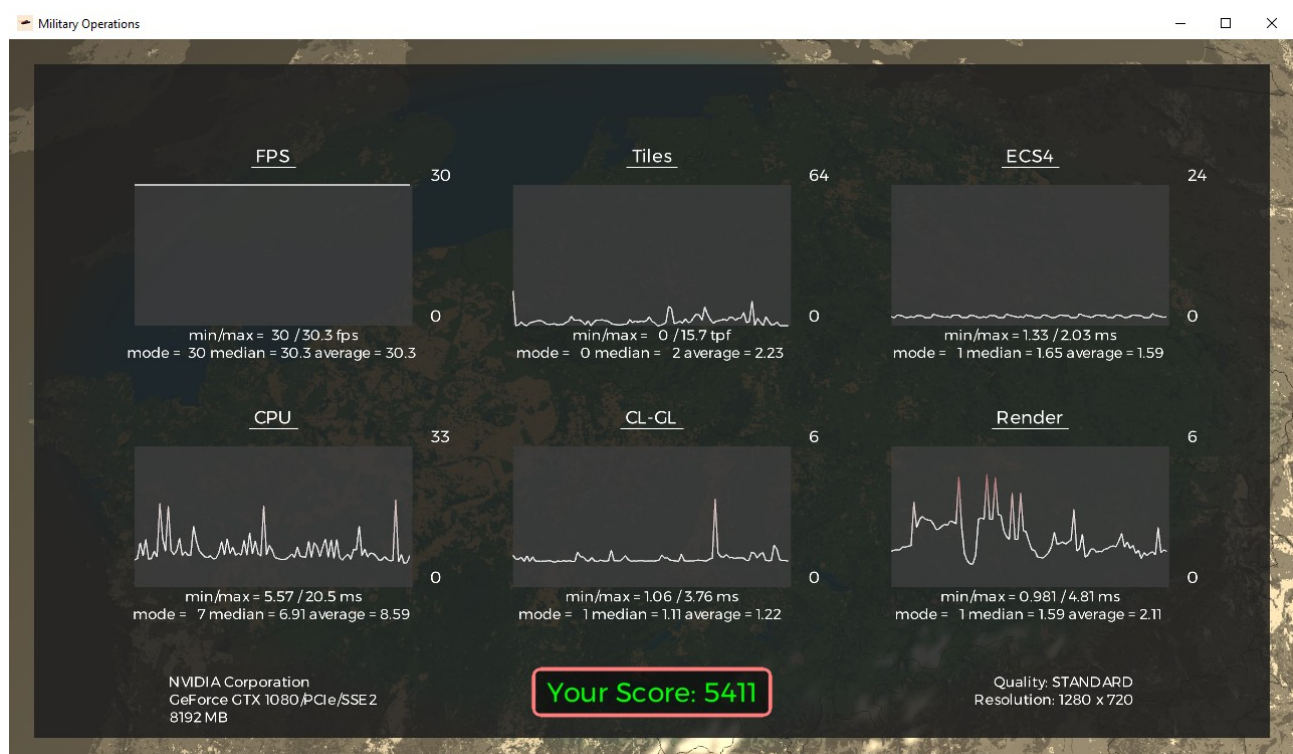
When the benchmark run was completed, a result screen is displayed.

A full run with visual quality set to "STANDARD", in 1920x1080 resolution, will be entered to the leader-board. A higher score will replace any existing score.

The score colour gives a hint as to the performance. See the Score-range table [9] for more information.

A red border around the score means it is not eligible for the leader-board. A green border means, it is.

For example, the score in this screen-shot will not be entered to the leader-board because it was run with a resolution of 1280x720. Hence the red border around the score.



Press any key to close the Benchmark results screen.

The score

Score range	Description	Score colour
0 - 2000	Your system is technically capable, but not powerful enough	Red
2000 - 3000	Your system is able to run MilOps, if quality is set to "LITE"	White
3000 - 4000	Your system is able to run MilOps	Light green
4000 - 5000	Your system is able to run MilOps for sure.	Green
5000 >	Your system is definitely able to run MilOps, and then some!	Bright green

If your score is higher than 4500, you could try to set visual quality to "HIGH" if you want to sacrifice simulation acceleration in favour of better visuals.

In general, what ever your settings, aim for a benchmark score between 3000 and 4000 for a good experience.

Graphs

Six graphs are shown, one for each profiling topic. Below each graph the following statistic values are displayed:

- min/max : The lowest and highest measured values
- mode : The most frequent value
- median : The middle value of a sorted list of all values
- average : The average of all measured values

The two numbers at the right of each graph, tell the range for measurements of that profile. The units for values are:

Profile	Unit	Description
FPS	fps	Frames per second displayed
Tiles	tpf	Tiles per frame accumulated
ECS4	ms	How long a simulation update takes
CPU	ms	How long an application loop takes
CL-GL	ms	How long to exchange data between OpenCL and OpenGL
Render	ms	How long it takes to render one frame

When the colour of a graph goes from white to red, the values are starting become too high/low. A perfect run would have no part of any graph become red(dish).

FPS

This one is self explanatory. It shows how often the display is refreshed. For MilOps this is fixed at 30fps. Higher rates are not needed for an RTS, and this way we can reserve as much GPU power for the simulation as possible.

Tiles

The MilOps world is partitioned in "tiles". These tiles describe the world so we can show unique features for every spot on the globe. When you move over the planet, these tiles are processed into data that can be rendered. Data is loaded from disk, uploaded to the GPU and processed there.

This graph tells how many of those tiles were accumulated for processing.

The lower these values the better, because if tiles are processed fast, the number of tiles that remain in queue for processing, will stay low.

ECS4

This is the heart of MilOps. The "Entity Component System" runs on the GPU and updates the simulation. If the simulation is accelerated, the ECS updates the simulation several times per frame.

The lower these values the better because that means the GPU can update the simulation fast.

CPU

The CPU isn't doing much in MilOps. Its main tasks are:

- reading data from disk
- receiving input from the user
- trigger tasks to run

All minor tasks compared to the simulation and game logic that is done in the ECS on the GPU. Most of the CPU time is waiting until things can be done on the GPU. This synchronisation is important though. If tasks have to wait too long before they can run, the application will still feel slow even though the tasks themselves are completed fast.

CL-GL

The simulation runs on the GPU and is implemented using OpenCL (Open Compute Library). Rendering is done in OpenGL.

To render a frame, the state of the simulation has to be extracted and converted into data that can be rendered. Also, some results of the render step are required by the simulation. This extraction and exchange of data is shown in this graph.

The lower these values, the faster the simulation and the renderer can exchange information.

Render

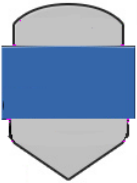
These values show how long it takes the GPU to render the data that was extracted from the simulation state. It includes everything that can be seen on screen but also any GPU based (background) processing/transfer that was required to prepare the tiles.

The lower these numbers the better.

The battlefield

When zooming-in closer, environment features like the terrain, vegetation and buildings become visible. Icons in the environment show positions of units.

Unit-icons



If the "NATO" icon style is selected, NATO symbolism is used to show details about the unit. Blue icons are allied, red icons are enemy units. Green units are friendly but will not participate in combat. This generally means the unit is a "dummy" and its OOB sub-tree is not (fully) specified.

Hovering one of the unit-icons will:

- high-light the icon
- show white lines to any visible units directly below that unit in the command-hierarchy (subordinates)
- show a blue line to its parent unit in the command-hierarchy
- change "heat-map" dots from blue to white
- display the name of the unit beneath the icon



Hovering a unit-icon with the mouse while the Detail-Dialogue is open (press "TAB" to toggle), will show detailed information about the unit. To make the detail dialogue contents "stick" to a unit, simply left-click on its icon.



Icon indicators

At the corners of the unit-con, indicators can appear. They signal a special condition of the unit. For example, low fuel or ammo state.

The current action the AI selected is also shown this way.

Indicators (possibly animating) can also appear when units perform an action like resupplying. Use the "Detail-Dialogue" to find out more.



Troops



The blue/red "heat-map" dots that change to white when hovering an icon show locations of both units and actual physical vehicles and infantry. The dots turning white are the units that belong to the command-sub-tree of the hovered unit-icon.

Zooming-in to the heat-map, dots will ultimately reveal 3D models of the physical troops.

When hovering a vehicle/soldier with the mouse it will:

- highlight the model
- show you its name
- display range circles on the terrain with the unit at the centre. The distance between "rings" is 100 meters. The red circle shows the weapon range, the yellow circle shows the view (sensor) range.

Left-clicking the unit will make it active. It will remain highlighted and the range circles stay visible even when the mouse is moved from the troop. Click on any inactive part of the screen to reset the selection.

The detail-Dialogue (press "TAB" to toggle) will show detailed information about that unit.

Troop indicators

When the vehicle or soldier is performing an action or has a special status, an indicator can appear above it. Use the "Detail-Dialogue" to find out more.



Objectives

One or more labels in the environment show objectives. The colour of the label's text shows if the objective position is currently under enemy (red) control or allied (blue) control.

Hovering or activating (clicking) the label will cause information to be shown in the detail-dialogue



Terrain

The terrain itself features elevation and different surface materials. Pressing "X" while moving the mouse across the terrain will show the kind of material at the mouse location.

If the probe is set in range-mode (icon in bottom bar), distance-range circles are drawn on the terrain. Depending on the altitude of the camera the distance between lines differs. The current distance between lines is shown at the mouse cursor.



Runtime menu

Pressing escape will summon a menu (and pause the simulation).

Quit

Quits the current battle and returns to the main-menu.

Settings

The same settings as in the main menu are available except the Video Quality presets since they require a re-initialisation.

Back

Closes the runtime menu and returns to the battle. Pressing "escape" in the menu will also close the menu.

Pause the simulation

At any time during the battle, the simulation can be paused by pressing the space-bar. Pressing the space-bar again, will resume the simulation.

When the battle is paused, a sepia vignette is shown.

Although the simulation is paused, you can still move the camera and interact.

Camera control

The main camera is the free-roam behaviour.

Rotate the camera by pressing and holding the right-mouse button, while moving the mouse.

Move the camera using the W, A, S, D keys (or place the mouse-cursor near the screen edges if this is enabled in the settings). Change the camera's altitude by pressing the Q and E keys or using the scroll-wheel.

The behaviour of the free-cam can be altered. By default W, A, S, D will move the camera "in orbit", meaning that the camera will remain at a fixed altitude. The altitude can be changed using the Q and E keys. This is called "orbit" mode in the control settings menu.

The second behaviour is "air plane" mode. This will cause to camera to move in the direction it is pointing, so the altitude is not constant.

The camera behaviour can be set in the menu: settings → controls → camera

When moving close to the terrain in Orbit-mode, the camera will start to follow the terrain while maintaining a constant clearance.

Follow troop camera

Many interactive elements support a "follow camera" behaviour. The camera will be attached to physical unit (troop) in the environment.

Left-clicking a troop while holding the "Alt" key will attach the camera to that troop so camera follows it. Zoom in/out using the mouse-wheel.

In general, to detach the camera from any follow-target, simply Alt+left-click somewhere on (the non-interactive part of) the terrain.

Move to unit

Unit-icons appear in both the 3D environment and the 2D UI. When Alt-clicking on any unit-icon, the camera will move (animate) to the corresponding unit. By default, this is performed by zooming in/out (depending on the unit size) and centring the unit position on screen, while keeping the current camera orientation. The behaviour can be changed in the options menu.

Unit shapes

When enabled (see chapter “Menu bar” [19]), blobs (outlines) around units show the area the units is occupying. Currently these shapes are shown for the activated and selected units, and their subordinates. Units can be selected by hovering their shapes with the mouse.



Order shapes

During the battle, shapes (arrow, front, etc.) are drawn on the terrain. Depending on the camera's position and the hierarchy level of the unit the order was issued to, these shapes are visible on the terrain.

An order for a low level unit will no longer be visible when zooming out and the order-shape of a high-level unit will fade out when zooming-in.



When an icon is hovered, any visible shape of an order issued to that unit will be highlighted as well.

The order shape itself can be hovered, causing it to become highlighted

Physical units (troops)

Vehicles and infantry shapes are selectable. Hovering the mouse will show additional information. If the Detail-Dialogue is open, information about the selected or activated troop will be displayed in the dialogue.

Objective labels

DINANT Objective labels can be hovered to highlight them. If the Detail-Dialogue is open, basic information about the objective will be displayed in the "Debug" tab. When the objective-label is Alt+Left-clicked, the camera moves to that objective.

Details dialogue

Many interactive items in the application can display information in the details-dialogue. It shows a live-updated feed of information about that item. The dialogue can be kept open as long as you like. To close the dialogue, press the "TAB" key, click "back" (upper left corner) or "X" (upper right corner).

The dialogue itself can be moved by dragging the caption bar.

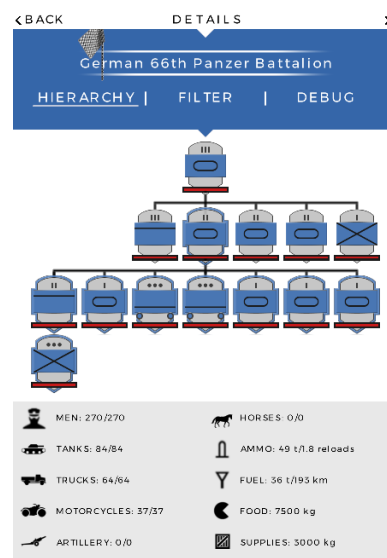
Unit hierarchy

The hierarchy TAB contains a detailed view on the unit command hierarchy.

The centre (highlighted) icon is the selected unit. Its name is printed at the top. Above the centre icon is the icon of the parent unit in the hierarchy. To the right and/or left, the unit's siblings in the hierarchy are displayed. Below the highlighted icon, all subordinates units are visible.

When hovering any of the icons in the hierarchy-view, the corresponding elements in the 3D environment are highlighted. Clicking on any of the icons in the hierarchy, makes that unit the activated unit and now that icon is displayed as the centre icon in the hierarchy, showing its parent, siblings and subordinates.

To make a unit in the hierarchy visible in the 3D view, simply Alt-click on its icon. The camera will animate to that unit and centre it in view.

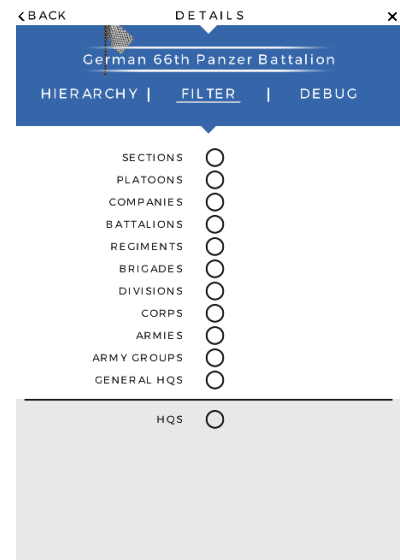


Unit filter

This TAB in the dialogue lets you display only icons for units of specific sizes.

Simply select the type of unit-icons you want to see. If no toggles are selected, the default behaviour determines what icons are displayed. The default behaviour uses a combination of metrics; camera altitude, unit size, and screen space.

Since screen-space is limited and the unit count high, icons will always struggle for a spot on screen, regardless of the filters or metrics used to pre-select icons. So it is not guaranteed all units of a certain size are visible. Zooming-in will improve the icon-count vs screen-space ratio.



Debug

This tab displays “under the hood” information intended for developers. But there is no harm in showing it to the curious-minded, so we left it enabled.

Fog Of War

FOW has been disabled for roaming. The user has an “umpire” status and can see all units and troops on the battlefield in any form (icon, physical, heat-map). Since we use NATO colour-coding to distinguish enemies from foes, we have to pick a side for the umpire. In this case the umpire sees the battle from the German side.

During play-testing, you play on the German side and you will only see French troops and icons if they have been discovered by your/allied forces.

Menu bar

At the bottom of the screen a bar with interactive items is located. From left to right:

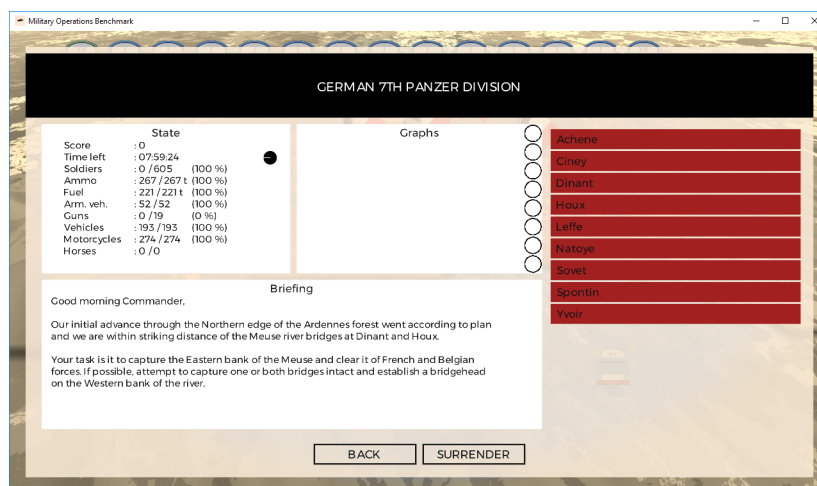
Toggle detail-dialogue



Left-click to toggle Detail-Dialogue. This floating dialogue displays a variety of details about the activated or selected unit, objective, soldier, vehicle or order. Drag the caption-bar to move the dialogue.

Pressing TAB will also toggle the detail-dialogue.

Toggle status-screen ('Test' only)



At any time during game-play testing, you can summon the status screen. It will show:

- The briefing
- All objectives and who has captured them.
- Remaining simulation time
- Statistics
- Graphs that show developments over time
- Your score that represents your progress and can be used add you to a Steam leader-board.

When alt+left-clicking on an objective, the camera will move to its location. The status-screen also gives you the option to surrender if you want to stop before play-time is over.

Pressing ENTER will also toggle the status-screen.

Front-line and occupancy-overlay



Clicking this symbol will summon a pop-up menu to select a area 'ownership' and front-line overlay for the terrain.

From top to bottom:

1. Show allied and enemy areas as well as the front-line
2. Show allied and front-line
3. Show front-line only
4. Show no occupancy overlay

The pop-out menu will automatically close if you move the mouse pointer away from it.

Unit-shape icon



Show shapes around all troops in the hierarchy sub-tree of the selected or activated unit (icon).

Mouse probe



Clicking this symbol will toggle between probing the terrain type at the mouse-pointer or concentric range lines on the terrain to help judging distances.

Heat-map icon



Left-click to toggle the heat-map on/off.

The heat-map shown 'dots' at troop and unit locations, making it easier to spot them from higher altitudes.

Hierarchy icon

Left-click to reset hierarchy visualisation to lines between the selected icon and their direct subordinates. Use the scroll-wheel to cycle:



- showing lines to icons of direct subordinates when hovering a unit icon.



- showing the full hierarchy subtree by drawing lines between all visible icons.

Simulation acceleration



Left-click to active a pop-out menu with al the available acceleration multipliers.

Note that depending on your system, not all accelerations may be possible. See “*System requirements*” [3] for more information. For example, selecting 30x could result in an effective acceleration of 19x. The simulation will update as fast as possible but not faster than the selected multiplier.

The pop-out menu will automatically close if you move the mouse pointer away from it.

You can also hover the mouse and apply the scroll-wheel to change acceleration or deceleration. Deceleration beyond real-time is supported (slow-motion).

Simulation date and time

Display-only, no interaction at the moment.

Game-play testing

This experimental feature has been added to provide early tastes of game-play concepts.

Objectives

During a limited amount of time you can try to capture as many objectives as you can. The briefing at the start will provide a more detailed context of the goals. The status-screen will show an overview of your progress, including captured objectives. For more details on this, see the “*Toggle status-screen*” [19] topic earlier in the guide.

Orders

To capture objectives you need to order your units. Only direct subordinates of your command-position can be ordered. Units that you can order have blue-icons.

Clicking on a blue unit-icon will activate that unit and show you the order radial-menu. For the current play-test you have 3 orders you can use:

Move cross-country



When selecting the move order the menu closes and an arrow is drawn over the terrain from the unit (shape) position to where ever you move the mouse-pointer. By shift+left-clicking, a waypoint is placed and the arrow-shape follows the mouse from the last placed waypoint.

To finish the move-order, simply left-click to place the last waypoint.

Front-order



Selecting the front order will close the order menu. A dot is drawn on the terrain at the mouse pointer. By left-clicking you set the start of the front. Any subsequent shift-left-click will add a point to the front. To finish the front order, set the last point by left-clicking.

The orientation convention for a front-order is, from left to right.

This means that if you place a front-order in front of the camera and you place the first waypoint at the left and the final at the right, that front will point to the direction you're facing.

Halt-order



The "halt" order simply removes any existing order from the unit. All physical units in the unit's command sub-tree will stop.

Camera bookmarks

The application shippes with a collection of pre-set bookmarks, mostly of locations where forces are in combat.

To save your own locations on the globe and easily return to them, up to ten camera bookmarks can be stored. Function-keys F1 to F10 can be used.

To store a bookmark, Press Shift + Function-key.

To jump to a previously stored bookmark, press the corresponding Function-key.

Bookmarks are saved automatically and are available again the next time the application is started.

Key mapping

The key-mapping in this application is fixed and can not be changed.

Camera movement		
Camera control	Binding	Description
Mouse-look	Hold down the right mouse button while moving the mouse	
Forward	W	Top screen edge
Backward	S	Bottom screen edge
Left	A	Left screen edge
Right	D	Right screen edge
Up	E	Scroll mouse wheel up
Down	Q	Scroll mouse wheel down
Turbo	Hold Shift key	While moving the camera
Slomo	Hold Alt key	While moving the camera
Follow	Alt-left mouse click	On a troop model
Un-follow	Alt+Left mouse click	On non-interactive terrain
Goto	Alt-left mouse click	On a unit-icon or label
Set bookmark	Shift + F1 through F10	Save camera locations
Recall bookmark	F1 through F10	Moves camera to location



Interaction		
Control	Binding 1	Remark
Toggle detail dialogue	TAB	
Toggle run-time menu	Escape	Default <i>Back</i> button
Show unit hierarchy	Hover unit icon	
Detach camera	Alt+Left-click on the terrain	Un-follow
Activate unit	Left-click on an icon	
Summon order menu	Left-click an icon in the scene	'Test' only
Toggle status-screen	Enter	'Test' only
Take screenshot	F11	Steam screenshot
Return/Close/Back	Escape	

Simulation		
Simulation control	Binding 1	Remark
Toggle pause	Space-bar	Sepia vignette is paused
Accelerate simulation	Scroll up on icon in menu-bar	Or key shortcut '+'
Decelerate simulation	Scroll down on acc icon	Or key shortcut '-'
Real-time simulation	Left mouse-click on acc icon	Or key shortcut '0'

Trouble shooting

Military Operations and the Metis technology are still in development. Several known and unknown issues exist.

In general, be sure to install the latest available drivers for your graphics card.

If a crash occurs, MilOps will detect it. The crash should automatically end up in our Bug-tracker.

For a comprehensive trouble-shooting guide, visit our support page on the website: <http://MilitaryOperationsHQ.com/support/>