MÄK TECHNOLOGIES

Stealth

The Virtual World Viewer and Navigator

MÄK Stealth

The Virtual World Viewer and Navigator

MÄK Technologies
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Cambridge, MA 02138 USA

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Glossary

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Preface

This manual is for persons who will install and configure the MÄK Stealth and for persons who will use it to view simulations. This guide assumes that you are familiar with basic administrative tasks and the graphical window environment for your operating system.

Because the Stealth is continually being improved and updated, some new features may have been implemented after this manual went to press. For the latest product information, please see the *RELNOTES* file in the root directory of the Stealth directory tree.

How the Manual Is Organized

This manual is organized as follows:

Chapter 1, *Introduction*, describes the basic features of the Stealth and introduces you to the Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) protocols.

Chapter 2, *Installing the MÄK Stealth*, describes system requirements and how to install the software. This chapter also explains how to run the Stealth demo script so you can experience a virtual world right away.

Chapter 3, *The Stealth Interface*, describes basic controls and operations: starting and exiting the Stealth, switching among the view-modes, attaching the eyepoint to entities, and saving or recalling user-defined view settings.

Chapter 4, *Controlling the Stealth View*, describes the Stealth's view-modes and how to change the position and orientation of the eyepoint.

Chapter 5, *Working with Entities and Aggregates*, explains how to attached the Stealth to entities and aggregates and describes aggregates in detail.

Chapter 6, *Display Features*, explains how to control visual effects such as lighting, fog and time-of-day, how to display and modify sensor volumes, how to use the Heads-Up Display, and how to show different parts of the Stealth on multiple displays.

Chapter 7, *Vehicle and Eyepoint Behavior*, deals with terrain effects on entity and eyepoint positioning. This chapter also describes how to create and play back a view-control script.

Chapter 8, *Communications*, covers setting the Stealth's IP addresses, selecting the exercises to be monitored, setting communication parameters, and making the Stealth visible to other applications.

Chapter 9, *Customizing the Interface*, shows how to set units of measurement, specify initial graphics display size and other window locations, adjust sensitivity of the controls and Spaceball, and control additional interface properties.

Chapter 10, *Advanced Options for SGIs*, describes graphics processing features and other advanced options available only on the SGI platform. These options primarily affect performance, and include culling, stress management and multiprocessing.

Chapter 11, *Stealth Accessories*, describes supporting software and utility programs shipped with the Stealth, including entity models and terrain databases. This chapter also provides brief descriptions of the *Stealth Sound Option*.

Appendix A, *Startup Options*, summarizes the command-line switches you can use when starting the Stealth.

Appendix B, *Configuring The Stealth*, describes commands that can be executed at startup through MÄK Technologies Lisp (.mtl) files.

Appendix C, *WRM Specification*, provides information about building entity models that comply with the WRM Entity Model Specification for DIS Interoperability.

Appendix D, *The UTM Coordinate System*, describes the different variations of this coordinate system.

The *Glossary* defines DIS and HLA terms and terms specific to the Stealth.

There are two *Quick Reference Cards* at the end of the manual that you can remove and keep near your computer for convenience. These cards cover startup options, keyboard shortcuts, view modes, and controlling the Stealth.

MÄK Products for the Virtual World

The Stealth is a member of the MÄK Technologies line of HLA/DIS software products designed to streamline the process of developing and using networked simulated environments.

In addition to the Stealth, the MÄK Technologies product line includes:

- The VR-Link Network Toolkit. The Toolkit is an object oriented library of C++ functions and definitions that implement the HLA RPR FOM and the DIS protocol. This library minimizes the time and effort required to build and maintain new HLA/DIS-compliant applications, and to integrate such compliance into existing applications.

  The Toolkit includes a set of sample debugging applications and their source code. The source code serves as an example of how to use the VR-Link Toolkit to write applications. The executables provide valuable debugging services such as generating a predictable stream of HLA or DIS messages, and displaying the contents of messages transmitted on the network.

  VR-Link is the basis of the other MÄK products.

- The MÄK Logger. The *Logger*, also called the *Data Logger*, can record HLA and DIS exercises and play them back for after-action review. You can play a recorded file at speeds above or below normal, or in reverse, and locate areas of interest quickly. The Logger lets you choose between a graphical interface, or a shell-style, command-line interface.

  The Logger comes with a set of utility programs that let you inspect, combine and edit Logger recordings.

- Dial-a-Sim. Dial-a-Sim is a reconfigurable DIS simulator program that lets you create and simulate vehicles quickly, with or without programming. Dial-a-Sim's graphical interface lets you assemble vehicles by choosing from a collection of predefined components. You can adjust the physical properties and positioning of these components to meet your exact needs.

  Once your vehicle is complete, you can drive it in a networked simulation. Dial-a-Sim provides a set of on-screen controls, and supports PC-compatible steering wheel assemblies and other hardware controls.

- The MÄK Plan View Display. The Plan View Display (PVD) provides a two-dimensional, "big picture" of a virtual environment. It shows simulated entities, such as vehicles, soldiers, and tanks moving over a 2D-map display. The MÄK PVD is compatible with both Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) simulation standards.
- The MÄK RTI. The MÄK RTI is the first commercial run-time infrastructure for HLA simulations.

Contact MÄK Technologies for more information about these products.

Getting Technical Support

For Stealth technical support, information about upgrades, and information about other MÄK products, you can reach us in the following ways:

For sales and upgrade information by e-mail:	vrlink-info-sales@mak.com
For technical support by e-mail:	vrlink-tech-spt@mak.com
For general MÄK information via the Web:	http://www.mak.com

Send postal correspondence to:	MÄK Technologies 185 Alewife Brook Parkway Cambridge, MA 02138

Call or fax us at:	Fax:	617-876-9208
	Voice Phone:	617-876-8085

Document Conventions

This document uses the following typographic conventions:

`Monospaced Type`	Indicates commands or values you enter.
`Monospaced Italic`	Indicates variables that you replace with appropriate values.
`[ ]`	Indicates optional arguments.
`|`	Separates options in a command where only one option may be chosen at a time.
/	Indicates a directory. Since MÄK products run on both UNIX and PC platforms, we use the / (slash) for generic discussions of pathnames. If you are running on a PC, substitute a \ (backslash) when you type pathnames.
Bold type	Indicates a new term.
Italic	Indicates a file name or path, or a class name.
sansSerif	Indicates a parameter or argument.
>	Indicates a one-step procedure.
Menu→Option	Indicates a menu choice. For example, an instruction to select the Save option from the File menu appears as: Choose File→Save.

Directory names are preceded with dot and slash characters that show their position with respect to the Stealth home directory. For example, the directory *stealth/binrpr* appears in the text as *./binrpr*.

Introduction

The MÄK Stealth is a spyglass into your networked, virtual world. It delivers a realistic, three-dimensional view of terrain, vehicles and other entities. The Stealth's navigation controls give you complete freedom to travel anywhere as an unobtrusive observer. You can place the eyepoint at a specific location, or link it to one or more vehicles for automatic tracking of battlefield activities. While an exercise is underway, you can switch view-modes quickly to see the scene from any perspective. The Stealth can be visible to other applications or invisible, at your discretion.

Figure 1-1. Sample Battle as Displayed by the MÄK Stealth

1.1. Main Features

The Stealth provides a range of features that make it an essential tool during any phase of a Distributed Interactive Simulation (DIS) or High Level Architecture (HLA) project. The PC version of the Stealth is based on Gemini's *OpenGVS* libraries. The Silicon Graphics (SGI) version is based on the *Iris Performer* libraries. The SGI version provides additional features that take advantage of Performer and advanced SGI hardware options.

1.1.1. Stealth Features on Both SGI and PC Platforms

Most features of the Stealth are available in both the SGI and PC versions.

Support for Both HLA and DIS

This release of the Stealth is compatible with the HLA Realtime-Platform Reference (RPR) FOM, and with DIS versions 2.0.3 (SGI only), 2.0.4, IEEE 1278.1-1995, and 2.1.4.

Realistic Display of Vehicles and Terrain.

The Stealth provides a realistic display using terrain and moving-model geometry in the MultiGen *OpenFlight* format.

Dozens of vehicle-graphics models are included, some that support the display of articulated parts in their proper orientations. These models can also switch appearance to appear in a damaged or destroyed state. The Stealth also displays:

- Smoking and flaming effects
- Muzzle flashes
- Ground hit and entity hit detonation sequences.

The Stealth presents terrain realistically, and lets you control fog, time-of-day, and other effects.

The Stealth supports attached parts.

Multiple View-Modes

The Stealth offers eleven view-modes that let you:

- Manually control the eyepoint's position and orientation.
- Automatically track a vehicle's movement from a fixed viewpoint, as if watching from a control tower.
- Link the eyepoint's position with a vehicle's position. You can place the eyepoint inside the vehicle for a driver's-eye view, or fly in tandem with the vehicle, outside.
- Attach the eyepoint's position to one vehicle while automatically tracking the movement of a second vehicle.
- View an entity while traveling around it along an orbital path.
- Keep a user-defined group of entities in view.
- View a group of entities involved in an exchange of weapon fire.

Accessible View Controls

You can select any Stealth view-mode with a single keystroke or mouse click. You can store and quickly recall up to eight view-mode/entity-attachment combinations.

Accurate Vehicle Positioning

The Stealth can smooth the trajectories of moving vehicles to compensate for discontinuous positional data. The Stealth's ground clamping feature can ensure that all ground entities are placed correctly on the terrain surface.

Heads-Up Display

The Stealth can overlay a set of indicators onto the main graphics display. These indicators show information about the eyepoint's position and heading, the position and heading of nearby entities, and information about the entity to which the eyepoint is attached.

Terrain Databases

The Stealth comes with the following terrain databases:

- Two versions of the Hunter-Ligget database: one suitable for use on current SGI machines and high-end PCs, the other for use on older or less powerful machines.
- The Monterey database for PCs and current SGI machines

The Stealth can load any OpenFlight database.

Remote Control

You can control the Stealth remotely, through ModSAF, through recorded view-control scripts, or through separate command-line utilities.

1.1.2. Features Available Only On the SGI Stealth

The Stealth for SGIs has several features that are not available on the Stealth for PCs.

Electromagnetic Emission Fields and Sensor Volumes

The Stealth can represent electromagnetic emission fields such as those generated by mine detectors, radar, and other devices. The electromagnetic field appears as a translucent volume.

Optional Sound

The Stealth's sound option provides stereo or quadraphonic playback of up to sixteen simultaneous battlefield audio events, and supports Doppler effects and other enhancements.

Support for Simultaneous, Multiple Displays

The Stealth supports SGI's Multi-Channel and Multipipe options, so you can divide the battlefield scene among several monitors for a wide field of view. In addition, you can display the Stealth's Motif-based GUI on a machine other than that used to display the main graphics display.

Support for Aggregates

The Stealth supports display of aggregates. An aggregate can be:

- A group of entities
- A group of aggregates
- A group of entities and aggregates

You can view hierarchies of aggregates and configure the Stealth to display specific levels of the aggregate hierarchies.

1.2. A Brief Introduction to DIS and HLA

Distributed Interactive Simulation (DIS) and High-Level Architecture (HLA) are means of representing players in a shared virtual world through the exchange of data between applications. These applications allow user interaction and usually run on separate, networked computers.

1.2.1. The DIS Protocol

The DIS protocol is a set of standards that govern how participating applications share information about the virtual world. The protocol specifies a set of packets, called protocol data units (PDUs), that communicate this information. Each PDU identifies the sender and contains other information depending on the PDU type. The DIS protocol also specifies when and how frequently PDUs are sent.

1.2.2. The HLA Protocol

HLA is a relatively new protocol that has been adopted as the standard technical architecture for all Department of Defense simulations. It allows more flexibility than DIS. The Run-Time Infrastructure (RTI) determines the wire formats and mechanisms for data delivery. Each individual simulation domain can develop its own Federation Object Model (FOM), which defines the types of information to be shared among simulators.

The Realtime-Platform Reference (RPR) FOM is based on the DIS protocol, and is therefore especially important to developers migrating applications from DIS to HLA. The Stealth supports the FOM defined within the Federation Execution Data (FED) file called *vrlink.fed* stored in the Stealth home directory. See the Release Notes for your version of the Stealth for complete information about the FOMs supported by the Stealth.

1.2.3. Obtaining Further Information about HLA and DIS

For information about HLA rules and specifications, visit the HLA Web site at:

http://hla.dmso.mil/

You can find general DIS information in the document library at the Simulation Interoperability Standards Organization (SISO) home page:

http://www.sisostds.org/doclib/

For documentation of the IEEE 1278.1-1995 and 1278.2-1995 versions of DIS, obtain the publication, *1278.1-1995 IEEE Standard for Distributed Interactive Simulation, Application Protocols*. For more information, visit the IEEE World Wide Web site at:

http://stdsbbs.ieee.org/products/catalog/catalog.html

Installing the MÄK Stealth

A full Stealth installation includes three components: the Stealth application, the FLEXlm license manager software, and for HLA operation, the RTI, or Runtime Infrastructure.

This chapter covers the following topics:

- System Requirements, on page 2-2
- Installing the Stealth for SGIs, on page 2-3
- Installing the Stealth for PCs, on page 2-5
- Setting Up and Using the FLEXlm License Manager, on page 2-7
- Obtaining and Installing a Runtime Infrastructure (RTI), on page 2-11
- Running the Stealth Demo (SGI only), on page 2-14

2.1. System Requirements

This section describes the general hardware and software requirements for installing the Stealth on SGI computers or PCs. See the Release Notes for your release of the Stealth for complete information about software and hardware requirements.

2.1.1. Hardware and Software Requirements for the Stealth for SGIs

The Stealth will run on all current Silicon Graphics workstations and some older models. Generally, the Stealth runs on any machine that supports Performer, and will not run on older machines that lack hardware and software Z-buffer support, such as the Indigo XS.

The Stealth is available for systems running Irix6.2 or later with OpenGL and Performer 2.2.

2.1.2. Hardware and Software Requirements for the Stealth for PCs

The Stealth for PCs requires the following:

- A Pentium-class PC (or higher) with a standard VGA or SVGA video board and CD-ROM drive.
- Windows NT version 4.0 or Windows 95.
- 14 Mb of disk space for program files, and 50 Mb for optional data files.
- A 3D video board based on the Voodoo (3Dfx) chipset or a video board with OpenGL drivers. The 3D board may have been included as part of your Stealth for PCs package.
- A second monitor enhances ease-of-use with boards based on the Voodoo chipset and is highly recommended, but is not required.

2.2. Installing the Stealth for SGIs

The installation process creates a directory tree named *stealthx.x* and a set of subdirectories.

1. Mount the Stealth CD-ROM and run the command:

   ```
   ./install
   ```

2. Follow the on-screen instructions.

2.2.1. What Is Installed on UNIX

The installation process creates a directory structure like that shown in Figure 2-1.

Stealth home directory.	`stealthx.x`
Executables for DIS 2.0.3.	├─ `bin3`
Executables for DIS 2.0.4, IEEE 1278.1 and 2.1.4.	├─ `bin5`
Executables for HLA with RPR FOM.	├─ `binRPR`
Configuration files.	├─ `config`
Terrain databases, vehicle models, sound data files.	├─ `data`
Documentation in printable PDF format.	├─ `doc`
License manager files.	├─ `flexlm`
Files used by the Stealth Sound Option.	└─ `lib`

Figure 2-1. Directory tree on SGI

Table 2-1 describe the contents of the directories.

Table 2-1: Contents of Stealth directories

Directory	Directory contents
./bin3	Executables for use with DIS version 2.0.3.
./bin5	Executables for use with DIS versions 2.0.4, 2.1.4, and IEEE 1278.
./binRPR	Executables for use with HLA.
./config	Configuration files.
./data	Two versions of the Fort Hunter-Ligget terrain database, a Monterey terrain database, and several vehicle models. Chapter 11, *Stealth Accessories* describes these files in greater detail. If you have the Stealth Sound Option, your sound data files are stored here.
./doc	Stealth documentation in a Adobe portable document format (PDF).
./flexlm	Files for the FLEXlm license manager.
./lib	Files used by the Sound Option.

2.3. Installing the Stealth for PCs

1. If you have not already done so, install your 3D video board. If you purchased the 3D board as part of your Stealth package, you may have received a separate instruction sheet containing more information.
2. Insert the MÄK Technologies PC Products CD into your CD-ROM drive.
3. From the Windows Explorer, run the *setup.exe* program, located in the root directory of the CD-ROM.
4. On the opening screen, select the Stealth.
5. Follow the on-screen directions.

   You will be prompted to confirm the directory where the Stealth is to be installed. You can replace the suggested default with a different destination.

   You can choose whether to install the data files. These files occupy about 50 Mb of disk space, and include terrain databases, vehicle models, clouds and textures. If you do not install these files during the initial installation, you can run Setup again later to install them. If you do this, be careful to uncheck the Program Files option during installation; otherwise you could overwrite your previously installed configuration files.
6. Based on the discussion in the following section, decide whether or not you need to change the default value for the SingleMonitor parameter.

Specifying Single or Dual Monitor Modes

You can run the Stealth using one monitor or two. If you use one monitor, the recommended monitor mode depends on the type of 3D card you have. Table 2-2 describes the options available and recommended default values.

Table 2-2: Options for setting the SingleMonitor parameter

Number of monitors	Type of 3D graphics card	Recommended default value
1	Voodoo chipset (3Dfx) with pass-through port	1 (Required for proper functioning)
1	Integrated 2D/3D card with OpenGL drivers	0
2	Any supported card	0

To set the monitor mode:

1. Open the *params.mtl* file in a text editor.
2. Change the SingleMonitor parameter to the desired setting, as described in Table 2-2.
3. Save the file and exit.

For a complete discussion of the differences between single and dual monitor operation, see "Single and Dual-Monitor Operation on the PC" on page 3-7.

2.3.1. What Is Installed on the PC

The installation process creates the Stealth directory tree shown in Figure 2-2.

```
Stealth home directory: main executable and help.      stealthx.x
    Configuration files.                                   ├─ config
    Terrain databases, vehicle models, textures, clouds.   ├─ data
    Documentation in printable PDF format.                 ├─ doc
    License manager files.                                 └─ flexlm
```

Figure 2-2. Directory tree on a PC

Table 2-3 describe the contents of the directories.

Table 2-3: Contents of Stealth directories

Directory	Directory contents
Stealth	The main Stealth executables, the on-line help file, and the primary configuration file, *Stealth.mtl*.
.\config	Editable configuration files in the MÄK Technologies Lisp (mtl) language. These files (along with *Stealth.mtl*, in the root directory) allow a great deal of control over how the Stealth operates. The contents of these files are described throughout this manual. *params.mtl* and *Stealth.mtl* are summarized in Appendix B, *Configuring The Stealth*.
.\data	Two versions of the Fort Hunter-Ligget terrain database, several vehicle models, textures and clouds.
.\flexlm	Files used by the license manager.

2.4. Setting Up and Using the FLEXlm License Manager

The Stealth, like other MÄK products, uses the FLEXlm license manager. Before you can use the Stealth, you must have a license server installed and a valid *license.dat* file. (For information about FLEXlm, view the FAQ page at www.globe-trotter.com/flmfaq.htm.) Contact the MÄK Technologies sales department for information about special licensing agreements.

2.4.1. Setting up the License Server

When you install the Stealth, FLEXlm files are installed in the *./flexlm* directory. The procedure you need to follow to set up license management depends on whether or not you have previously installed a MÄK product that uses the license manager.

If you have no other MÄK products installed

The machine on which you run the license manager is the license server. It can be the same machine as the one on which you installed the Stealth, or a different one. If you want to use a different machine as the license server, copy the files in the *./flexlm* directory to that machine.

To set up the FLEXlm license server:

1. Change to the *flexlm* directory on the license server.
2. Execute *lmhostid.* This program generates a unique number that MÄK uses to generate your license activation codes.
3. Call or e-mail MÄK with the name of the server and the number obtained by *lmhostid*. MÄK will e-mail or FTP you a file named *license.dat*.
4. Put the *license.dat* file in the *flexlm* directory on the license server and on all machines on which you have the Stealth installed.
5. On each machine that has a *license.dat* file, set the environment variable LM_LICENSE_FILE to the absolute path to *license.dat*.

   Windows 95

   On Windows 95, set environment variables in the *Autoexec.bat* file, for example:

   ```
   set LM_LICENSE_FILE=”C:\Program Files\MÄK Technologies\
      flexlm\license.dat”
   ```

   Note: Do not put spaces around the = sign. Put quotes around the path. The drive letter must be uppercase.

Windows NT

On Windows NT, you set environment variables in the Environment tab of the Properties dialog box for the machine:

1. Right-click the My Computer icon on the Desktop.
2. On the pop-up menu, select Properties. The System Properties dialog box opens.
3. Select the Environment tab.
4. In the Variable text field, type LM_LICENSE_FILE.
5. In the Value field, type the pathname of the file, for example:

```
"C:\Program Files\MÄK Technologies\flexlm\license.dat"
```

Note: The drive letter must be uppercase.

UNIX

On UNIX, set the variable similarly to the following example:

```
setenv LM_LICENSE_FILE /usr/local/stealth/flexlm/license.dat
```

6. Edit the *license.dat* file to specify the location of the *maklmgrd* executable on the server machine. The file supplied by MÄK represents this location with a dot as shown below:

```
DAEMON maklmgrd .
```

Replace the dot with your absolute path to *maklmgrd*, for example:

```
DAEMON maklmgrd "C:\Program Files\MÄK Technologies\
   flexlm\maklmgrd"
```

Note: On PCs, you must enclose the path in quotes. The drive letter must be uppercase.

If you already have a license.dat file from other MÄK products

If you have other MÄK products, you can set up a separate license server for the Stealth, in which case follow the procedure on the previous page. Or, you can merge the license information for the Stealth with that of previous products and use the same license server.

To obtain and merge license information:

1. Change to the *flexlm* directory on the license server.
2. Execute *lmhostid.* This program generates a unique number that MÄK uses to generate your license activation codes.
3. Call or e-mail MÄK with the name of the server, the number obtained by *lmhostid*. MÄK will e-mail or FTP you a file named *license.dat*. The file is in a format similar to the following:

```
SERVER mollusc 006097752f93 4567
DAEMON maklmgrd .
PACKAGE stealth maklmgrd 1999.177 60D00041FA200D8A795D \
      COMPONENTS=stealth1
INCREMENT stealth maklmgrd 1999.177 1-jan-0 1 0BB480511615C175B8CF \
      PLATFORMS=i86_n
```

Your existing license.dat file is similar to the following:

```
SERVER mollusc 006097752f93 4567
DAEMON maklmgrd "c:\Program Files\MÄK Technologies\stealth\flexlm\
      maklmgrd"
PACKAGE makproduct maklmgrd 1999.177 40C020D12D609AB04D55 \
      COMPONENTS="hprod1 dprod1 prod1"
INCREMENT makproduct maklmgrd 1999.177 1-jan-0 1 AB4450916DD1944435D2 \
      PLATFORMS=i86_n
```

Note: The line continuation marks (\) in the examples are for clarity of presentation. They may not be present in the files you receive.

4. Open up the two files in a text editor. Append everything except the Server and Daemon lines (the Server lines will be identical) from the new *license.dat* file to the end of the old *license.dat* file. For example:

```
SERVER mollusc 006097752f93 4567
DAEMON maklmgrd "c:\Program Files\MÄK Technologies\stealth\flexlm\
      maklmgrd"
PACKAGE makproduct maklmgrd 1999.177 40C020D12D609AB04D55 \
      COMPONENTS="hprod1 dprod1 prod1"
INCREMENT makproduct maklmgrd 1999.177 1-jan-0 1 AB4450916DD1944435D2 \
      PLATFORMS=i86_n
PACKAGE stealth maklmgrd 1999.177 60D00041FA200D8A795D \
      COMPONENTS=stealth1
INCREMENT stealth maklmgrd 1999.177 1-jan-0 1 0BB480511615C175B8CF \
      PLATFORMS=i86_n
```

5. Put the updated *license.dat* file in the *flexlm* directory on the license server and on all machines on which you have the Stealth installed.

2.4.2. Running the License Server

The FLEXlm license server must be running on the server machine and the LM_LICENSE_FILE variable must be set on the local machine before you can run your MÄK applications.

> To start the license server, on the server machine only, execute *runLm* from the *./flexlm* directory.

> To obtain the current status of the server, run *lmstat*.

Shutting Down the License Server

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

2.4.3. Troubleshooting the FLEXlm License Manager

For general troubleshooting information, refer to the FLEXlm FAQ at www.globetrotter.com/flmfaq.htm. It describes common problems, including the majority that have been reported to MÄK support engineers. Please consult the FAQ first when you have a problem.

Unable to Get A License - Port in Use

If you are unable to get a license for a MÄK application and the FLEXlm log file indicates that the port is in use, it is possible that you have more than one *lmgr*d or *maklmgrd* processes running. It is also possible that an application that was using a license is thought to have terminated, but is still alive. To verify and resolve these possibilities:

1. See if more than one *lmgrd* or *maklmgrd* process is running. On Windows NT, check the Task Manager. On UNIX, enter the following command:

   ```
   ps -aux | grep lmgrd
   ps -aux | grep maklmgrd
   ```

2. If more than one of either process is running, note the process ids (PID) for both executables and kill all of them, for example:

   ```
   kill -9 1385 878
   ```

   where 1385 and 878 are process IDs.

   It is important that you kill all the processes to ensure a clean restart for the license server.

3. See if there are old processes running that may be using a license. On Windows NT, check the task manager. On UNIX, use `ps -aux`.

Note: Some UNIX systems use `ps -aux`, others `ps -ef` to check processes. Use the command appropriate for your operating system.

4. If there are old processes present that may be using a license, kill them.

5. If in step 2 you killed the license server, start it with the `runLm` command.

Preventing Multiple License Manager Processes

We recommend that you keep the license server running and that you not start and stop it as you run applications. If you prefer to stop the license server when you are not using it, always use `lmdown` to stop it.

Whenever you start the license manager, first run `lmstat` to be sure that there is not already a license server process running. Following this practice will ensure that you do not start multiple license servers.

2.5. Obtaining and Installing a Runtime Infrastructure (RTI)

An RTI (Run-Time Infrastructure) is a software library (and perhaps supporting executables) that implements the HLA Interface Specification. In HLA, applications exchange FOM data through RTI calls, which means that all HLA applications need to use an RTI. (Applications that use VR-Link typically do not need to make RTI calls directly, but only because VR-Link makes the RTI calls for them.)

Because of differences in the low-level network mechanisms used by different RTI implementations (which include, but are not limited to packet layout), applications that want to interoperate in the same federation execution must use the same RTI implementation. Because RTIs are provided as dynamic libraries that implement a fixed API, a federation can easily switch from one RTI implementation to another between runs (without even recompiling the applications), but during each run, all participants must agree on which RTI to use, much as they must also agree on which FOM to use.

The two RTI implementations against which all MÄK products have been tested are the MÄK RTI (which comes with all MÄK products), and the DMSO RTI (which is available from the DMSO web site).

2.5.1. Installing the MÄK RTI

The MÄK RTI is included with all MÄK products and you have the option of installing it as part of product installation.

UNIX

The installation process creates a link called *RTI* in each product's root directory, which points to the *makRti* directory, in which the MÄK RTI software is located.

PCs

The project files point to the default installation directory for the RTI.

Configuring Your System to Use the MÄK RTI

The RTI dynamic library needs to be located somewhere on your dynamic library search path. This path is indicated by an environment variable as follows:

- For IRIX6n32 use LD_LIBRARYN32_PATH
- For DEC Alpha, use PATH
- On other UNIX platforms use LD_LIBRARY_PATH
- On PCs, use PATH

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

- The FED file (*.fed*) for your federation execution (required)
- The RID file (*rid.mtl*) (optional)

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

Running Application with the MÄK RTI

You do not need a server, such as the *rtiexec*, or central application to use the MÄK RTI, however you can run the *rtiexec* if you want to. Be sure the license server is running, then start the applications, and they should be able to communicate. (For information about the license server, see "Setting Up and Using the FLEXlm License Manager".) See the *MÄK RTI Reference Manual* for information about changing the networking parameters such as multicast addresses, UDP ports, and the *rtiexec*.

Documentation for the MÄK RTI

The documentation for the MÄK RTI consists of:

- *MÄK RTI Reference Manual*
- The documentation set for the DMSO RTI. Aside from the installation and configuration instructions, the documentation for the DMSO RTI also applies to the MÄK RTI. It is included on the MÄK product CD.

2.5.2. Installing the DMSO RTI

You can get the DMSO RTI from DMSO's web site (http://hla.dmso.mil). Click on Software Distribution Center, where you can register for an account, then later download the RTI software. Documentation for the DMSO RTI is provided on the MÄK product CD because the documentation applies to the MÄK RTI as well.

Consult the DMSO Release Notes to determine version information and whether or not any patches are required.

Install the RTI according to the instructions provided.

Before you use the DMSO RTI for the first time, run the *configRTI* scripts provided in the root directory of any MÄK product. Provide the location of the RTI directory as an argument, as in these examples:

UNIX

```
configRTI /usr/RTI1.3
```

PCs

```
configRTI "c:\program files\rti\rti1.3"
```

configRTI copies the *VR-Link.fed* file from the MÄK products root directory to the DMSO RTI's config directory.

Configuring Your System to Use the DMSO RTI

To configure the environment:

> On UNIX systems, source the *RTI.env* file.

> On Windows systems, set environment variables and add the RTI location to your path. The RTI's README file contains detailed instructions.

Running Applications Using the DMSO RTI

To use the DMSO RTI, you need to run the RTI executive (*rtiexec*). This executable resides in the RTI's *bin/platform_name* directory (UNIX) or in the RTI's *bin* directory (PCs). Run *rtiexec* only on one machine, regardless of how many HLA applications you are running.

Once the RTI is running, you can run HLA applications.

2.6. Running the Stealth Demo (SGI only)

If you have the MÄK Logger as well as the Stealth, you can dive right into a virtual world by running the Stealth and Logger demo.

Note: If you have a Silicon Graphics machine, but don't have the Logger, you can download a modified demo from the MÄK Technologies Web site. It contains versions of the Stealth and Logger that can communicate only with each other, and not with other applications on the network. Visit www.mak.com for details.

The demo script starts a Stealth and a Logger. The Logger plays back a recorded exercise to generate entities in a virtual world. The Stealth provides a 3D out-the-window view into that world. The exercise presented in the demo involves two A-10s attempting to destroy seven ground targets near an airfield.

The Logger recording contains View Control messages, which cause the Stealth to switch among many stored view-modes/states to follow the action.

You can run the demo off the CD (if the CD contains both the Stealth and Logger releases), or from the installation directory.

To run the demo:

1. Start the license manager. (You do not need the license manager for the modified demo.)
2. Change to the *stealthx.x.x/bin5* directory for DIS or *stealthx.x.x/binRPR* directory for HLA.
3. Enter:

   ```
   run-demo-hi
   ```

If you are running the demo from disk, rather than from the CD, *run-demo-hi* assumes that the Stealth and Logger distributions have been installed into the same parent directory. If your Logger directory is not a sibling of the Stealth directory, use the `-logger` switch to tell *run-demo-hi* the location of the Logger directory:

For example, if you have installed the Logger as /usr/MAK/loggerx.x, you can run:

```
run-demo-hi -logger /usr/MAK/loggerx.x
```

Alternatively, you can set up a soft link called Logger as a sibling to the Stealth directory, that points to the location of your Logger directory.

If your machine has Impact or O2 graphics, you may want to disable the detail textures in the Monterey terrain database:

```
run-demo-hi -nodetail
```

For better performance on the lower end machines, you may also want to use a smaller version of the terrain database:

```
run-demo-hi -small -nodetail
```

2.6.1. Manually Controlling the Eyepoint

The eyepoint position is automatically controlled by View Control messages in the Logger file. If you want to control the eyepoint manually, click on the Stealth Options button in the main control window, then select Ignore from the ViewControl Options menu.

For information about attaching to entities and selecting view-modes, see sections "Selecting View-Modes" on page 4-16 and "What is the Eyepoint?" on page 4-2, or click the Help button on the main control window.

2.6.2. Running the Demo Applications on Separate Machines

To demonstrate the exchange of data between applications on different machines, run the Stealth and Logger as described below.

Note: The Stealth runs only on a Silicon Graphics machine or a PC, but the Logger can run on other platforms. See your Logger documentation for more information.

Execute the following commands from the *./bin* directory.

- If you are using a Reality Engine or Impact graphics, run:

  ```
  Stealth -N -l montyDemo.mtl
  ```

  and on another machine, run:

  ```
  Logger -p ../logger_tapes/montyDemo.lgr
  ```

- If you are using a lower-end SGI machine, run:

  ```
  Stealth
  ```

  and on another machine, run:

  ```
  Logger -p ../logger_tapes/iitsec93.dis204
  ```

If the applications appear to have trouble communicating over the network, please see the network troubleshooting configuration topics in your Logger documentation.

The Stealth Interface

This chapter explains how to start and stop the Stealth and describes the Stealth dialog boxes.

Topics include:

- Starting and Exiting the Stealth for SGIs, on page 3-2
- Starting and Exiting the Stealth for PCs, on page 3-9
- Single and Dual-Monitor Operation on the PC, on page 3-7
- What Happens at Startup, on page 3-9
- Stealth Dialog Boxes, on page 3-12

3.1. Starting and Exiting the Stealth for SGIs

Before you can start the Stealth, the license manager must be running.

To start the Stealth:

1. Switch to the appropriate *./bin* directory in the *stealthx.x* directory tree.
2. Enter:

```
Stealth [options]
```

Table 3-1 describes the most frequently-used Stealth command line options. For a comprehensive list, see Appendix A, *Startup Options*.

Command-line options are case sensitive. Except for `-N`, options can appear in any order.

Table 3-1: Common startup options

Option	Description
`-h`	Displays a help message and command summary, then exits.
`-P` *`portnumber`*	Specifies the UDP port the Stealth uses to receive and send data. (DIS only)
`-S` *`mcastAddress`*	Subscribes the Stealth to the specified multicast address. To subscribe to several multicast addresses, use this option more than once on the command line. (DIS only)
`-l` *`mtl-file`* `-l` *`"mtl-command"`* `-l` *`parm=value`*	Lets you perform any of the following from the command line at startup: - load an MTL (MÄK Technologies lisp) configuration file. - execute an MTL command. - set a parameter. This option is commonly used to load configuration files in addition to (or instead of) *Stealth.mtl*. See page "Specifying Parameters from the Command Line" on page B-17 for examples and more information.
`-N`	Prevents loading of the *Stealth.mtl* configuration file. This option is most often used in conjunction with the another command that loads an alternate configuration file. If used, `-N` must be the first option to appear on the command line.
`-T`	Prevents the loading of a terrain database, for quick startup.
`-W` *`size`*, or `-W` *`width`*`,`*`height`*	Sets the initial size of the graphics display, in pixels. Specify a single *size* value for a square window, or separate values for *width* and *height*.
`-x` *`exerciseID`* `-x` *`fed_name`*	DIS: Specifies the exercise ID. Default: All exercises. HLA: Specifies the federation execution name. Default: VR-Link.

3.1.1. What Happens at Startup

Assuming that the Stealth configuration files are unmodified, and that you do not use any command-line options, the following sequence of events occurs at startup.

1. The *Stealth.mtl* configuration file is loaded.
2. *Stealth.mtl* loads a series of additional configuration files:

- The *stSoundOpt.mtl* file loads the Stealth sound software, if your license supports it.
- The *params.mtl* file sets parameters (approximately 200) that affect the Stealth's display, user interface, data processing and special features. For a description of this file, see Appendix B, *Configuring The Stealth*.
- The *viewsave.mtl* file restores any user-defined Stealth view states that have been saved during previous sessions. For a description of saving and recalling view states, see section 4.6, "Saving and Recalling View-States".
- The model-mapping files, *EntityTypes.mtl*, *Models.mtl*, *Viewpoint.mtl*, and *ModelMap.mtl*, define associations between entities and corresponding visual models stored in OpenFlight-format data files. You can find more information about model mapping files under section 11.2, "Working with Entity Models".
- A file that loads a terrain database. As shipped, the *Stealth.mtl* file loads the *IITSEC-95.mtl* file which in turn, loads a version of the Hunter-Ligget terrain database. For information about the terrain databases, see section 11.1, Working With Terrain Databases.

As shipped, the *Stealth.mtl* configuration file simply loads other configuration files. You can modify it to perform a different set of actions.

Command-Line Processing Sequence

During startup, configuration files and options are processed in the following order:

1. The *Stealth.mtl* configuration file is processed along with any other configuration files that it references. This file is always processed unless you bypass it with the `-N` option.
2. Command-line options are processed in order from left to right. If you use the `-l` option to load additional (or alternative) configuration files, the settings in those files override any parameters set earlier by other options or by *Stealth.mtl*.

3.1.2. Initial Startup State

When you start the Stealth with default configuration files and no command line options, it opens a graphics display in full-screen mode. The Stealth displays a small control-panel window and a two-dimensional overlay, or Heads-Up Display.

The main control window provides access to Stealth dialog boxes. You can use the F1 key to hide or redisplay these controls.

The 2D overlay, also called the heads-up display, includes indicators and readouts describing the eyepoint's position and orientation, and information about other nearby entities.

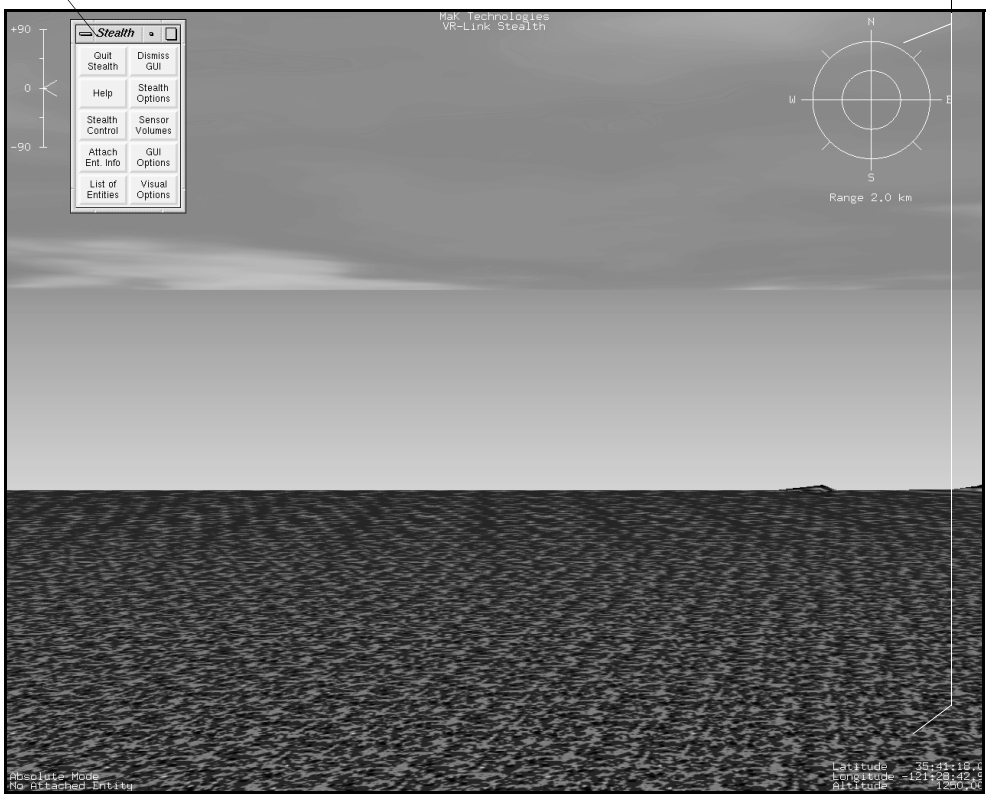


Figure 3-1. The Stealth for SGIs at startup

You can customize various startup defaults by editing configuration files. For example, you can change the contents of the heads-up display (or turn it off), load a different terrain database, or set the initial window size. For more information, see the description of the *Stealth.mtl* and *params.mtl* files in Appendix B, *Configuring The Stealth*.

3.1.3. The Main Control Window

The main control window is a small button palette. This window gives you access to the Stealth's dialog boxes.

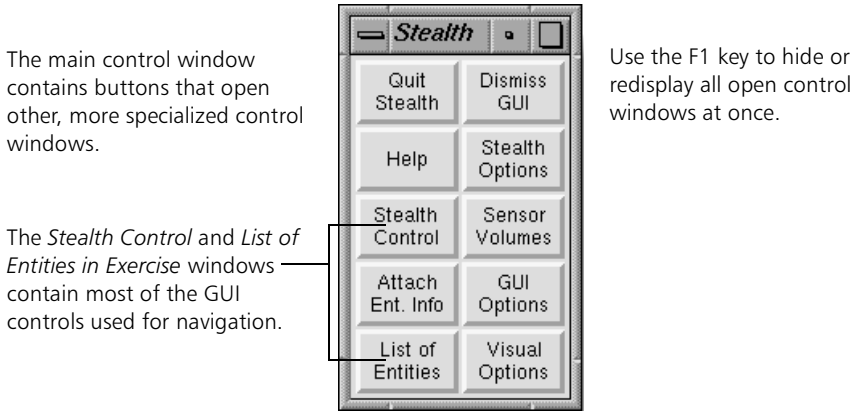


Figure 3-2. The Main Control Window on Stealth for SGIs

Table 3-2 describes the functions of the buttons in the main control window.

Table 3-2: Main control window buttons (Sheet 1 of 2)

Button	Description (details)
Quit Stealth	Closes the Stealth. (section 3.1.4)
Dismiss GUI	Hides the main control window and any open dialog boxes. Press F1 to redisplay the windows.
Help	Displays a summary of operating instructions and hot keys.
Stealth Options	Opens the Stealth Options dialog box for controlling features such as the heads-up display, ground clamping, and smoothing of vehicle movement. (section 3.4.4)
Stealth Control	Opens the Stealth Control dialog box, which sets the view-mode and controls eyepoint position and orientation. (section 3.4.1)
Sensor Volumes	Opens the Sensor Volumes dialog box, which lets you control the display of electromagnetic emissions. (section 3.4.6)
Attach Ent. Info	Opens the Info on Attached Entity dialog box, which displays data about the current attached entity, including Entity ID, Force ID, position, velocity, and orientation. (section 3.4.2)
GUI Options	Opens the GUI Options dialog box, which lets you set units of measurement, adjust the sensitivity of on-screen controls, and specify how often data readouts are updated. (section 3.4.5)

Table 3-2: Main control window buttons (Sheet 2 of 2)

Button	Description (details)
List of Entities	Opens the Entities in Exercise dialog box, which lets you attach the Stealth to entities and agTregates. (section 3.4.3)
Visual Options	Opens the Visual Options dialog box, which provides access to Traphics-related options such as time-of-day, drawing style, and earth, sky, and fog attributes. (section 3.4.7)

3.1.4. Exiting the Stealth for SGIs

To exit the Stealth, use one of the following methods:

- Click the Quit Stealth button in the main control window
- Press Escape while the mouse pointer is over the graphics display.

An exit confirmation prompt appears, unless it has been disabled at startup with the `-X` option.

3.2. Single and Dual-Monitor Operation on the PC

The Stealth for PCs works differently depending on whether you are using a one-monitor or two-monitor configuration.

3.2.1. Dual-Monitor Operation

In a dual-monitor configuration, the graphics display appears on one monitor and the Stealth control window on the other. You can use the Stealth's control windows to control the eyepoint, attach to entities, and choose view-modes.

Note: The keyboard's eyepoint-position and orientation controls are enabled only when the Stealth's main control window has focus.

3.2.2. Single-Monitor Operation

If you are running the Stealth using one monitor, its behavior depends on the type of 3D graphics card you are using, Voodoo chipset or OpenGL.

Single-Monitor Operation with A Voodoo Chipset Graphics card

If you are using a graphics card based on the Voodoo chip set and a pass-through port, you can view the Stealth control window (on the Windows desktop), or the graphics display, but not both at once. The F1 key lets you toggle between these views.

When the graphics display is on screen, you can use the keyboard to perform most control actions, including eyepoint navigation, attachment to entities, and view-mode changes.

When the control window is on screen, you gain access to all control and information windows, but you will not be able to see the effect of these controls until you switch back to the graphics display.

Important Instructions for Toggling the Graphics Display and Windows Desktop

The F1 key toggle and keyboard controls work only if the Stealth control window has focus on the Windows desktop. To ensure that this is the case, the control window is maximized while the 3D graphics are displayed. When you toggle to the Windows desktop, the control window is resized automatically.

To ensure that the control window will be maximized properly when you toggle back to the graphics display, do not resize this window or you risk being unable to control the Stealth from the keyboard and may not be able to toggle back to the Windows desktop from the graphics display.

Setting the **singleMonitor** parameter to 1 (the default) ensures that the Stealth control window will be maximized.

Single-Monitor Mode with a Graphics Card Using OpenGL Drivers

If you are using a graphics card that uses OpenGL drivers, the Stealth graphics are displayed in a standard resizable window on the Windows desktop. Therefore, the Stealth control window and the graphics display are both visible at the same time (assuming that you don't maximize one of the windows.)

If you set the **SingleMonitor** parameter to 1, when the Stealth starts, the Stealth control window will be maximized. You can resize the window without the problem of losing focus, as you would have with a Voodoo chipset with pass-through graphics card. However, if you want to avoid the necessity of resizing the control window every time you start the Stealth, set the **SingleMonitor** parameter to 0.

3.3. Starting and Exiting the Stealth for PCs

To start the Stealth:

> On the Windows Start menu, choose Programs→MÄK Technologies→*stealthX* where *stealthX* is *Stealth5* for DIS or *SteathRPR* for HLA.

You can also start the Stealth from the command line or set up a shortcut that uses command-line options. For a list of command line options, see Appendix A, *Startup Options*.

3.3.1. What Happens at Startup

With the default configuration files, the following sequence of events occurs at startup.

1. The *Stealth.mtl* configuration file is loaded.
2. *Stealth.mtl* loads the following series of additional configuration files:

- The *params.mtl* file sets parameters that affect the Stealth's display, user interface, data processing and special features. For a description of this file, see Appendix B, *Configuring The Stealth*.
- The *viewsave.mtl* file restores any user-defined Stealth view states that have been saved during previous sessions. For a description of saving and recalling view states, see "Saving and Recalling View-States" on page 4-18.
- The model-mapping files, *EntityTypes.mtl*, *Models.mtl*, *Viewpoint.mtl*, and *ModelMap.mtl*, define associations between entities and corresponding visual models stored in OpenFlight-format data files. You can find more information about model mapping files under "Working with Entity Models" on page 11-6.
- A file that loads a terrain database. As shipped, the *Stealth.mtl* file loads the *IITSEC-95.mtl* file which in turn, loads a version of the Hunter-Ligget terrain database. For information about the terrain databases, see "Working With Terrain Databases" on page 11-2.

As shipped, the *Stealth.mtl* configuration file simply loads other configuration files. You can modify it to perform a different set of actions.

Screen Behavior While the Stealth is Loading

The Stealth control window gets displayed quickly whether in single-monitor or dual-monitor mode. However, on slower machines it may take as long as one or more minutes to load model files. During that time the graphics display is blank or may display a logo or some other graphic. In single-monitor mode, the blank screen or logo overlays the Stealth window, so you may not realize that the program is functioning. Allow time for the files to load before checking on the status of the Stealth task. Remember that if you are in single-monitor mode and using a graphics card with a Voodoo chipset and a pass-through port that you must press F1 to access the Stealth control window. (You cannot switch while the model files are loading.)

3.3.2. Initial Startup State on the PC

When you start the Stealth with default configuration files, it opens the main control window on your Windows desktop, and displays the out-the-window view (also called the graphics display) on your second monitor (Figure 3-3). If you have a single-monitor configuration and are using a graphics card with a pass-through port, the graphics display covers the Windows desktop. Press F1 to see the Stealth control window. If you have a single-monitor configuration and are using a graphics card with OpenGL drivers, the Stealth control window and graphics display are in separate windows on the Windows desktop.

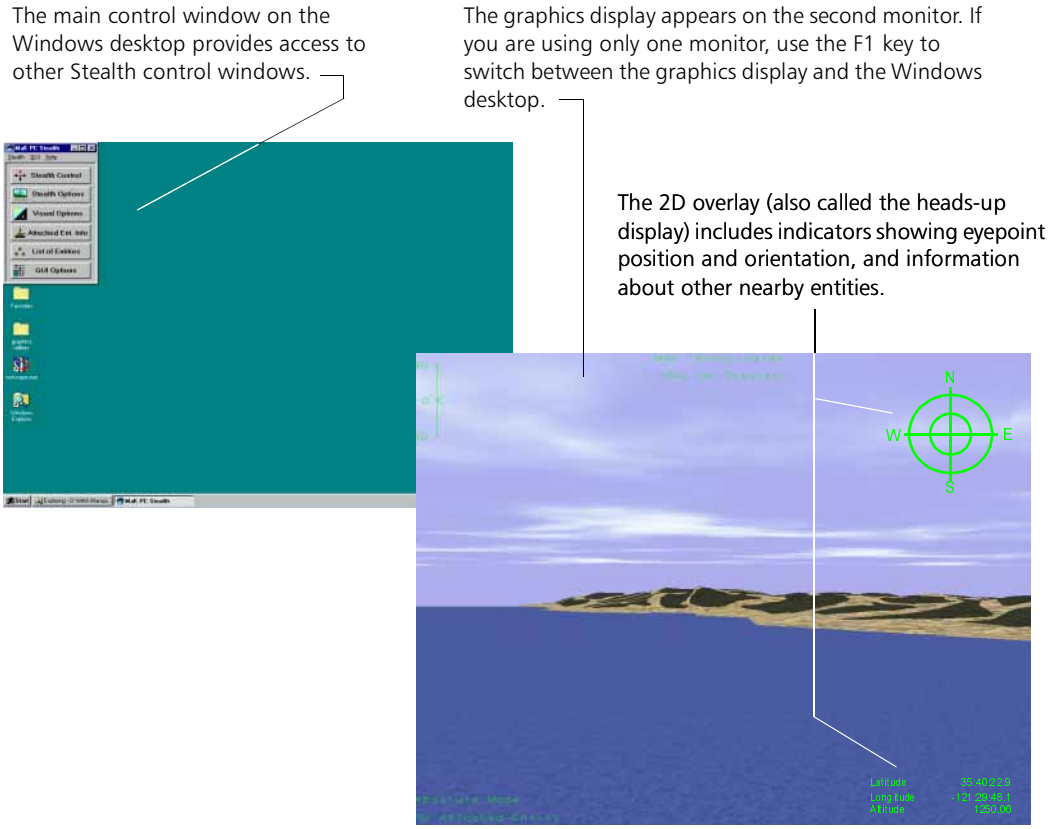


Figure 3-3. The Stealth for PCs at startup in dual-monitor mode

3.3.3. The Stealth for PCs Main Control Window

The main control window (Figure 3-4) is a small button palette that appears at startup. This window gives you access to the Stealth's dialog boxes, including those used to navigate within the virtual world.

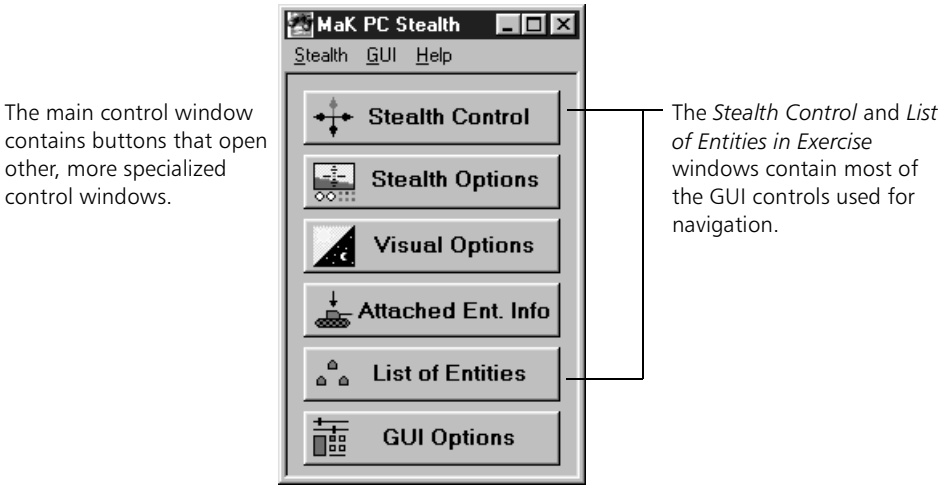


Figure 3-4. The Main Control Window in Stealth for PCs

The buttons in the main control window have the following functions:

Table 3-3: Main control window buttons

Button	Function (details)
Stealth Control	Opens the Stealth Control dialog box, which lets you set the view-mode and controls eyepoint position and orientation. (section 3.4.1)
Stealth Options	Opens the Stealth Options dialog box for controlling special features including the heads-up display, ground clamping, and smoothing of vehicle movement. (section 3.4.4)
Visual Options	Opens the Visual Options dialog box, which provides access to graphics-related options such as time-of-day, clipping, and fog attributes. (section 3.4.7)
Attached Ent. Info	Opens the Info on Attached Entity dialog box, which displays data about the current attached entity, including Entity ID, Force ID, position, velocity, and orientation. (section 3.4.2)
List of Entities	Opens the Entities in Exercise dialog box, which lets you attach the Stealth to entities. (section 3.4.3)
GUI Options	Opens the GUI Options dialog box, which lets you set units of measurement, adjust the sensitivity of on-screen controls, and specify how often data readouts are updated. (section 3.4.5)

The GUI menu lets you hide the main control window and suspends Stealth processing. The Help menu displays a summary of keyboard controls.

3.3.4. Exiting the Stealth for PCs

To exit the Stealth, do one of the following:

> Choose Stealth→Exit in the main control window.

> Press Esc.

3.4. Stealth Dialog Boxes

The following sections describe the dialog boxes that you open from the Stealth main window.

3.4.1. Stealth Control Dialog Box

The Stealth Control dialog box (Figure 3-5) contains navigation and orientation controls.

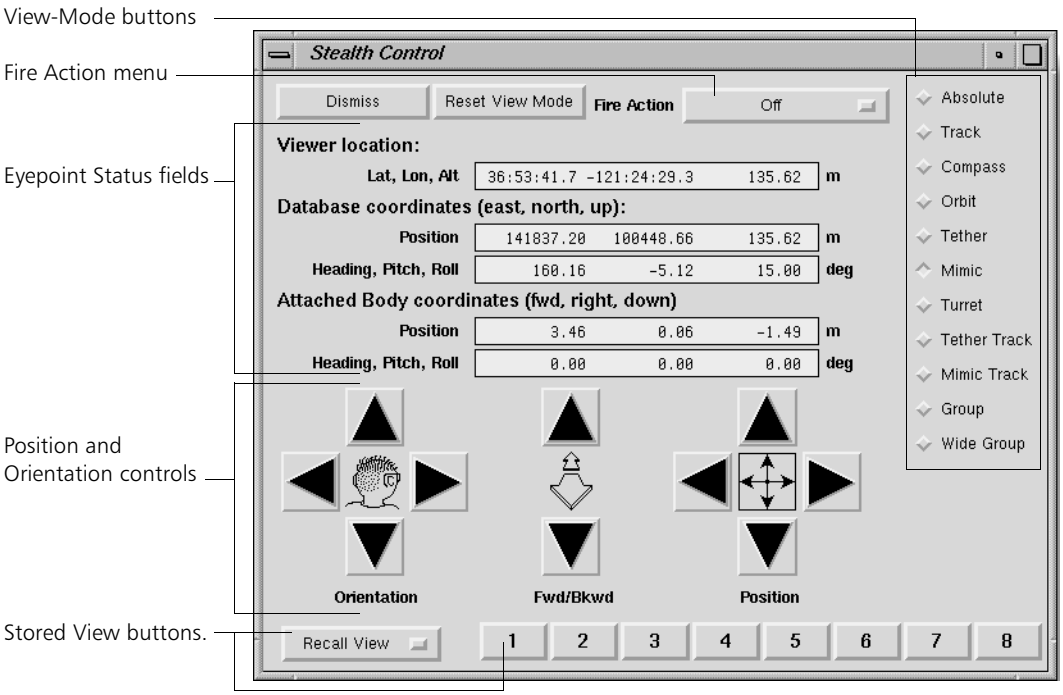


Figure 3-5. Stealth Control dialog box

Table 3-4 describes the fields and buttons in the Stealth Control dialog box.

Table 3-4: Stealth Control dialog box options

Field/Button	Description (details)
Dismiss	Closes the dialog box.
Reset View Mode	Restores the eyepoint to the default position and orientation for the current view-mode.
Fire Action list	Drop-down list for setting views of munition fire exchanges. In these modes, the Stealth changes view-modes automatically to provide the best view of a munition fire exchange. (section 4.5)
Viewer Location	Eyepoint using geodetic coordinates. (section 9.1.2)
Database Coordinates	Eyepoint using UTM coordinates or east, north, up (ENU) topographic system. (section 9.1.2)
Attached Body Coordinates	Eyepoint in geocentric, body frame, or topographic offsets. (section 9.1.2)
Orientation	Changes orientation of the eyepoint in its current position in the context of the current view mode. (section 4.2)
Fwd/Bkwd	Changes the distance from the eyepoint to the selected object in the context of the current view mode. (section 4.2)
Position	Moves eyepoint relative to the terrain in the context of the current view mode. (section 4.2)
Recall View list	Lets you set and save views. (section 4.6)
View Mode	Lets you choose type of view. (section 4.4)

3.4.2. Info on Attached Entity Dialog Box

The Info on Attached Entity dialog box (Figure 3-6) describes the entity to which the Stealth is attached. This dialog box is read-only, but you can change the coordinate system used to display information.

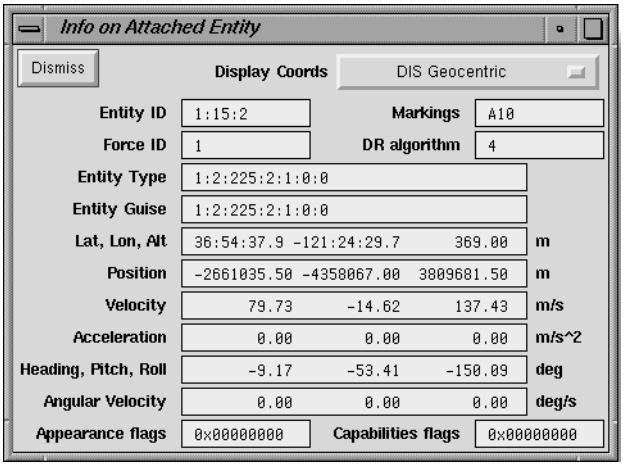


Figure 3-6. Info on Attached Entity dialog box

Table 3-5 describes the fields and buttons on the Info on Attached Entity dialog box.

Table 3-5: Info on Attached Entity dialog box options (Sheet 1 of 2)

Field/Button	Description (details)
Dismiss	Closes the window.
Display Coords	Drop-down list box that lets you choose the coordinate type to use. (section 4.7)
Entity ID	ID of the attached entity.
Force ID	A description of the entity such as friendly, hostile, neutral, and so on.
Entity Type	A DIS enumeration that describes the vehicle type.
Entity Guise	A DIS enumeration that describes how the entity looks to the opposing force.
Lat, Lon, Alt	Latitude, longitude, and altitude.
Position	The locations of the entity using the display coordinates.
Velocity	Speed at which the object is moving.
Acceleration	Rate of increase of speed for the object.

Table 3-5: Info on Attached Entity dialog box options (Sheet 2 of 2)

Field/Button	Description (details)
Heading, Pitch, Roll	Displays the heading, pitch, and roll of the entity.
Angular Velocity	Speed at which the object is rotating.
Appearance Flags	A string that determines various aspects of how an entity looks, such as, an open hatch on a tank.
Capabilities Flags	A description of the capabilities of the entity. Refer to the DIS or HLA protocol documentation for a definition.
Markings	A string used to carry extra information about the entity.
DR algorithm	The dead reckoning algorithm.

3.4.3. Entities in Exercise Dialog Box

The Entities in Exercise dialog box (Figure 3-7) contains a list of all entities in the virtual world. This window is a convenient tool for attaching the eyepoint to one or more entities.

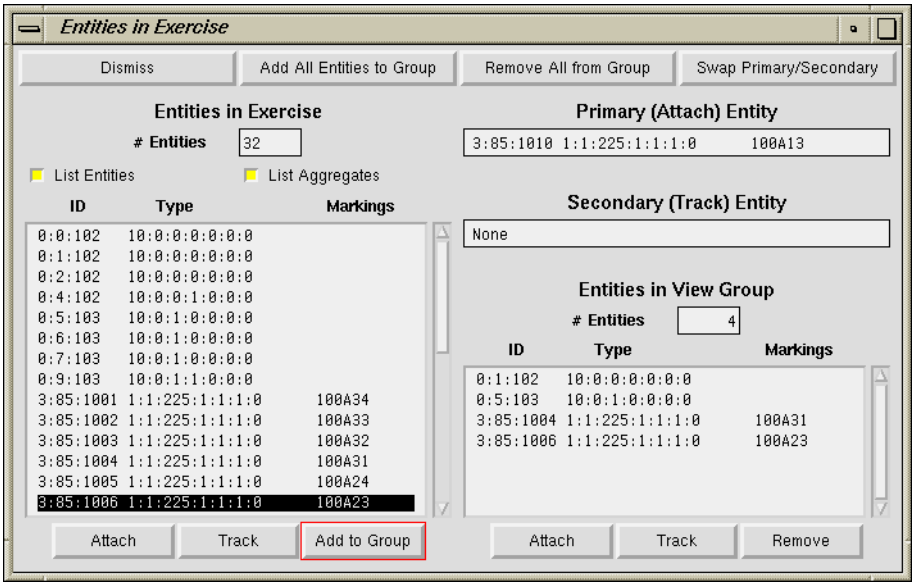


Figure 3-7. Entities in Exercise dialog box (SGI)

Table 3-6 describes the fields and buttons in the Entities in Exercise dialog box.

Table 3-6: Entities in Exercise dialog box options (Sheet 1 of 2)

Field/Button	Description (details)
Dismiss button	Closes this window.
Add All Entities to Group	Adds all entities to the selected group. (section 5.2)
Remove All from Group	Removes all entities from the selected group. (section 5.2)
Swap Primary/Secondary	Makes the attached entity the tracked entity and the tracked entity the attached entity. (section 5.2)
	Entities in Exercise
# Entities	The number of entities in the exercise.
# Removals	The number of entities that have been removed from the exercise. (PC only, not pictured)

Table 3-6: Entities in Exercise dialog box options (Sheet 2 of 2)

Field/Button	Description (details)
List Entities	Select checkbox to list entities. Clear checkbox to remove entities from list. (SGI only) (“Toggling the Display of Entities On and Off (SGI only)” on page 5-2)
List Aggregates	Select checkbox to list aggregates. Clear checkbox to remove aggregates from list. (SGI only) (section 5.4.2)
Entity list	A list of entities, aggregates, and possibly other objects, such as Stealths in the exercise with ID, type, and markings.
Primary (Attach) Entity	The entity to which the Stealth is attached.
Secondary (Track) Entity	The entity being tracked by the Stealth.
Attach button	Attaches the Stealth to the selected entity. (section 5.1)
Track button	Assigns the selected entity to be tracked by the Stealth.
Add to Group	Adds the selected entity to the selected group.
	Entities in View Group
# Entities	The number of entities in the view group. (section 5.2)
Group list	List of entities in the view group with ID, Type, and Markings. (section 5.2)
Attach button	Attaches the Stealth to the selected entity. (section 5.1.1)
Track button	Specifies that the selected entity is to be tracked by the Stealth. (section 5.1.1)
Remove button	Removes the selected entity from the view group. (section 5.1.1)

3.4.4. Stealth Options Dialog Box

The Stealth Options dialog box (Figure 3-8) lets you control a variety of aspects of the Stealth. The Stealth for PCs (Figure 3-9) has a subset of the options available on Stealth for SGIs.

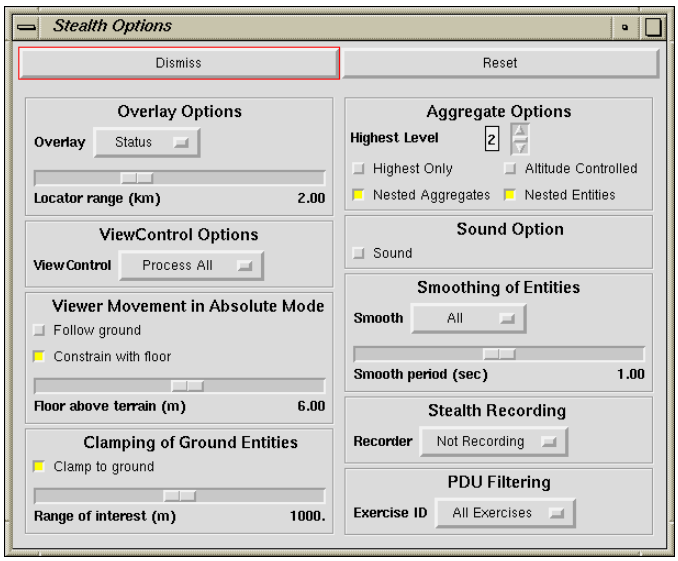


Figure 3-8. Stealth Options dialog box for SGI

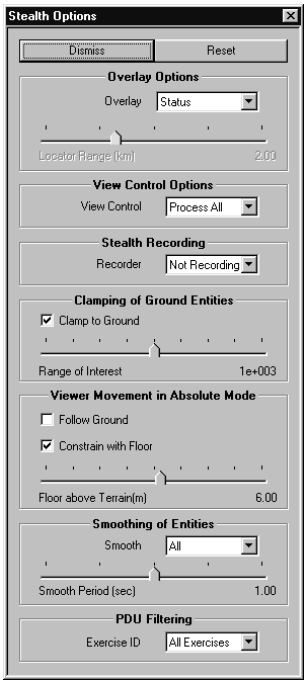


Figure 3-9. Stealth Options dialog box for PC

Table 3-7 describes the fields and buttons on the Stealth Options dialog box.

Table 3-7: Stealth Options dialog box options

Field/Button	Description (details)
Dismiss	Closes the window.
Reset	Sets all values to the defaults.
Overlay	Drop-down list to control what is displayed in the Heads-Up Display. (section 6.1)
Locator range	The diameter of the area covered by the Entity Locator. Default: 2 km. (section 6.1.2)
View Control	Enables processing of view-control messages. (section 7.7.1)
Follow Ground	Check to cause the eyepoint to maintain a constant distance above the terrain surface. (section 7.4.2)
Constrain with Floor	Check to enable the view floor. Clear to disable the view floor. (section 7.4.1)
Floor Above Terrain	The height above the terrain, below which the eyepoint is not allowed to go. (section 7.4.1)
Clamp to Ground	Toggles ground clamping on and off. (section 7.1)
Range of Interest	The distance from the eyepoint within which you want to clamp object to the ground. (section 7.1)
Highest Level	Specifies the highest aggregate hierarchy level to be displayed. (SGI only) (“Highest Level”)
Highest Only	Display only those aggregates whose top node is at the highest level setting. (SGI only) (“Highest Only”)
Nested Aggregates	Toggles display of nested aggregates on or off. (SGI only) (“Nested Entities and Nested Aggregates”)
Altitude Controlled	The highest displayed level of aggregation is controlled by the altitude of the eyepoint. (SGI only) (“Altitude Controlled”)
Nested Entities	Toggles display of nested aggregates on or off.(SGI only) (“Nested Entities and Nested Aggregates”)
Sound	Toggles the sound option on and off. (SGI only) (section 11.4)
Smooth	Drop-down list for trajectory smoothing options. (section 7.3)
Smooth Period	The period of time over which trajectory smoothing takes place. (section 7.3)
Exercise ID	Lets you filter PDUs in or out based on the exercise ID. (DIS only) (section 6.3.6)

3.4.5. GUI Options Dialog Box

The GUI Options dialog box (Figure 3-10) lets you:

- Set how often readout fields in the window are updated
- Select units of measurement
- Adjust the sensitivity of the Stealth Control window's positional controls.

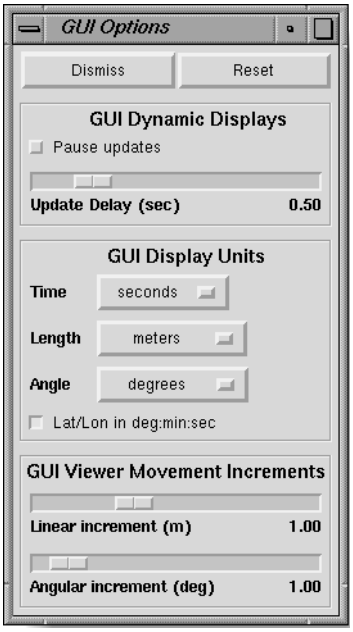


Figure 3-10. GUI Options dialog box

Table 3-8 describes the fields and buttons on the GUI Options dialog box.

Table 3-8: GUI Options dialog box options (Sheet 1 of 2)

Field/Button	Description (details)
Pause Updates checkbox	Stops or starts updating of position and orientation information in the Stealth Control dialog box, Entities in Exercise dialog box, and the Info on Attached Entity dialog box.
Update Delay	Specifies how often information is updated in the Stealth Control dialog box, Entities in Exercise dialog box, and the Info on Attached Entity dialog box. (section 9.1.1)
Time	Specifies the units of time used in the Info on Attached Entity dialog box. (section 9.1.2)
Length	Specifies the units of length used in the Stealth Control dialog box and the Info on Attached Entity dialog box. (section 9.1.2)

Table 3-8: GUI Options dialog box options (Sheet 2 of 2)

Field/Button	Description (details)
Angle	Specifies the type of angle used in the Stealth Control dialog box and the Info on Attached Entity dialog box. (section 9.1.2)
Lat/Lon in deg:min:sec checkbox	Turns specification of latitude and longitude in degrees:minutes:seconds on or off. The alternative is a decimal number. (section 9.1.2)
Linear Increment	Specifies the increments in which linear changes occur. (section 9.1.2)
Angular Increment	Specifies the increments in which angular changes occur. (section 9.1.2)

3.4.6. Sensor Volumes Dialog Box (SGI and DIS only)

The Sensor Volumes dialog box (Figure 3-11) lets you display electromagnetic sensor information.

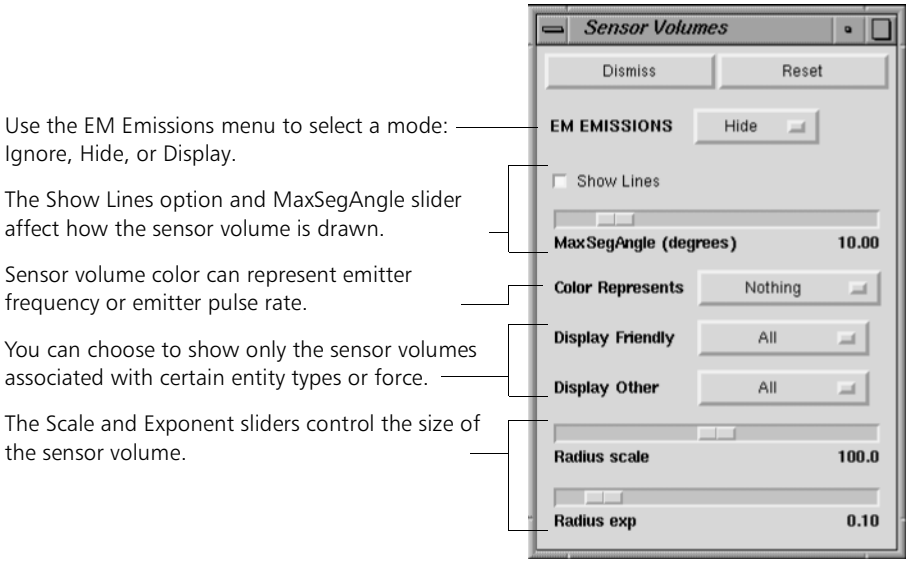


Figure 3-11. Sensor Volumes dialog box

Table 3-9 describes the fields and buttons in the Sensor Volumes dialog box.

Table 3-9: Sensor Volumes dialog box options

Fields/Buttons	Description (details)
Dismiss	Closes the window.
Reset	Sets window values to the defaults. (section 6.2)
EM Emissions	Drop-down list with options for displaying electromagnetic emissions. (section 6.2)
Show Lines	Controls how the sensor is drawn. (section 6.2)
MaxSegAngle	Controls how the sensor is drawn. (section 6.2)
Color Represents	Determines whether color represents frequency, emitter pulse, or nothing. (section 6.2)
Display Friendly	Shows sensors associated with friendly forces. (section 6.2)
Display Other	Shows sensors associated with non-friendly forces. (section 6.2)
Radius Scale	Controls the size of the sensor volume. (section 6.2)
Radius Exp	Controls the size of the sensor volume. (section 6.2)

3.4.7. Visual Options Dialog Box

The Visual Options dialog box (Figure 3-12) lets you set options for how the terrain and atmosphere look and act.

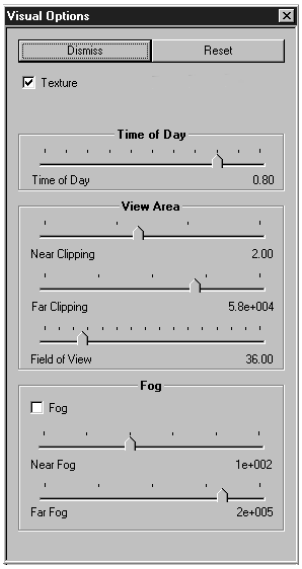


Figure 3-12. Visual Options dialog box for PC

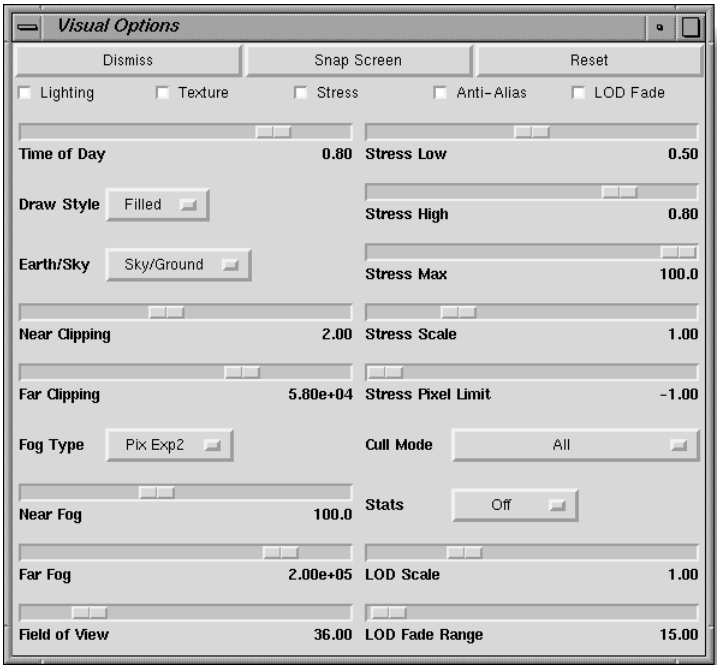


Figure 3-13. Visual Options dialog box for SGIs

Table 3-10 describes the fields and buttons in the Visual Options dialog box.

Table 3-10: Visual Options dialog box options (Sheet 1 of 2)

Fields/Buttons	Description (details)
	Fields on PCs and SGI
Dismiss	Closes this window.
Reset	Sets values back to defaults.
Texture	Turns texture on or off. (section 6.3.1)
Time of Day	Sets illumination where 0 is midnight and 1 is mid-day. (section 6.3.2)
Near Clipping	Sets the nearest point beyond which there is no clipping. (section 6.3.3)
Far Clipping	Sets the farthest point at which there is no clipping. (section 6.3.3)
Field of View	Allows you to increase or decrease the total area of terrain that is visible. (section 6.3.4)
Near Fog	Sets the point at which fog first becomes visible. (section 6.3.5)
Far Fog	Sets the point at which the fog becomes opaque. (section 6.3.5)
	PC Only
Fog check box	Turns fog on and off. (section 6.3.5)
	SGI Only
Draw Style	Controls how the entities are drawn. (section 6.4.2)
Earth/Sky	Controls how the terrain is drawn. (section 6.4.3)
Snap Screen	Captures the screen to a file (in RGB format) in the directory from which you started the Stealth. (section 6.4.5
Stress check box	Turns stress processing on or off. (section 10.4)
Anti-Alias check box	Turns anti-aliasing of objects on or off. (section 6.3.7)
Lighting	Turns lighting on or off. (section 6.4.1)
LOD Fade check box	Turns transition blending on or off in the level of detail. (section 10.3)
Fog Type	Drop-down list that lets you choose the type of fog to display. (section 6.3.5)
Stress Low	Sets the point below which level of detail is increased. (section 10.4)

Table 3-10: Visual Options dialog box options (Sheet 2 of 2)

Fields/Buttons	Description (details)
Stress High	Sets the point above which level of detail is compressed. (section 10.4)
Stress Max	Sets the point at which minimum level of detail is displayed. (section 10.4)
Stress Scale	Lets you adjust Stress High and Stress Max in tandem. (section 10.4)
Stress Pixel Limit	Sets the width of objects above which stress processing is not applied. (section 10.4)
Cull Mode	Specifies the mode used to discard objects not in the view. (section 10.5)
Stats	Turns on an overlay of statistics. (section 10.6)
LOD Scale	Specifies the distance at which to do LOD processing. (section 10.3)
LOD Fade Range	Controls the size of the blend zone in which LOD transition blending takes place. (section 10.3)

Controlling the Stealth View

This chapter describes view-modes and how to control the position and orientation of the Stealth eyepoint.

Topics include:

- Controlling the Eyepoint's Position and Orientation, on page 4-2
- View-Modes, on page 4-6
- Selecting View-Modes, on page 4-16
- Viewing an Exchange of Munition Fire, on page 4-16
- Saving and Recalling View-States, on page 4-18
- View-Mode Quick Reference, on page 4-20

4.1. What is the Eyepoint?

The eyepoint is the point in the virtual world from which you view the entities and terrain. The eyepoint's position and orientation are controlled by three factors:

- The current Stealth view-mode. Depending on the view-mode, the eyepoint is unattached, or is attached to one, two, or more entities.
- The movement of the entity (or entities), if any, to which the eyepoint is attached.
- Operation of the Stealth's positional controls using the:
  - Stealth Control dialog box
  - Keyboard
  - Spaceball

Note: The Stealth for SGIs supports viewing of aggregates. The view-modes treat aggregates as entities. Therefore, in this chapter, explanations about how view-modes and positional controls affect the view of entities apply equally to aggregates.

4.2. Controlling the Eyepoint's Position and Orientation

You can control the position and orientation of the eyepoint from the keyboard or from the Stealth Control dialog box.

The orientation controls do not change latitude, longitude, or altitude of the eyepoint. The eyepoint stays in the same location in space, but looks in different directions from that point.

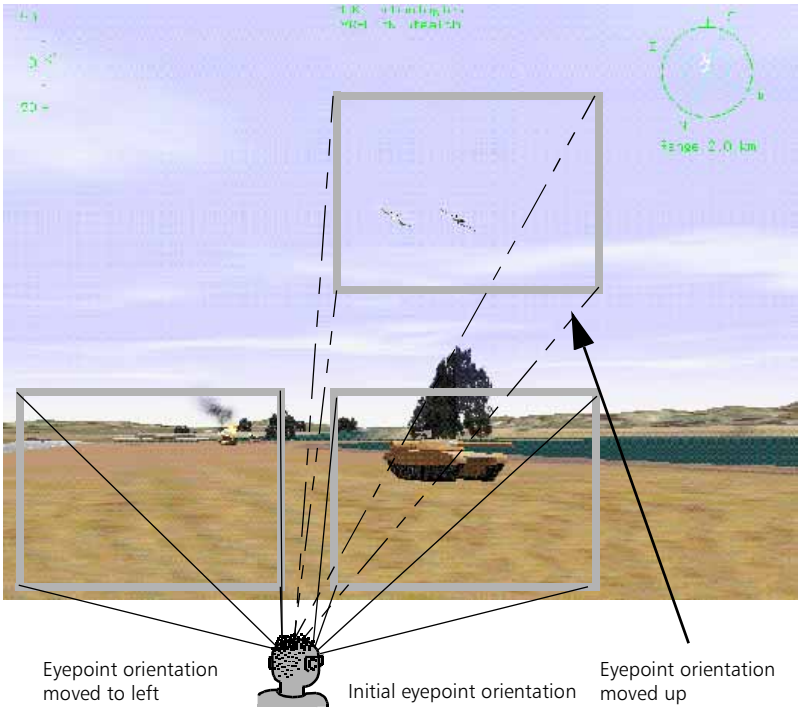
The position controls change the latitude, longitude, or altitude, or a combination of them for the eyepoint. The way in which the eyepoint changes is determined by the view-mode you are using.

Figure 4-1 contrasts the effects of changing the orientation controls with changing the position controls. Both pictures show the same set of views of a simulation. In the top set, the views are changed using the orientation controls. The eyepoint can look in all directions, but does not itself move in space. Changing the orientation is analogous to standing in one place and turning your head in a circle to see your surroundings.

In the bottom set, the view is changed by using the position controls. The eyepoint moves in space to achieve the different views of the simulation.

The position and orientation controls work a little differently in each view-mode. Therefore, Figure 4-1 is a bit simplistic in that it doesn't take into account any particular view-mode or attachment to an entity. As you get used to working with the Stealth, you will learn how to achieve the effects you desire.

Use orientation controls to view different places in the simulation without changing the location of the eyepoint.



Use position controls to view different places in the simulation by changing the location of the eyepoint

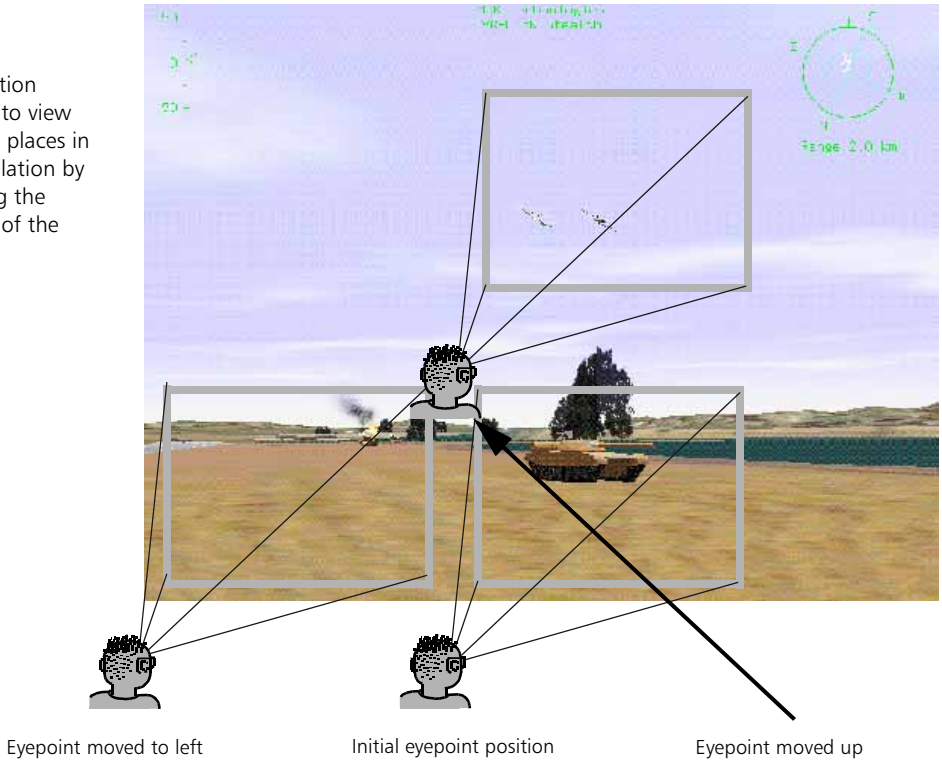


Figure 4-1. Orientation controls contrasted with position controls

4.2.1. Using Eyepoint Controls

In the Stealth Controls dialog box, if a control is not supported in a particular view-mode, the arrows are grayed out. However, in most view-modes, the controls work as shown in Figure 4-2. The arrow keys near the lower edge of the keyboard control orientation, while the keys on the numeric keypad control position. The keys correspond to the controls on the Stealth Control dialog box as indicated by the arrows. The zero key restores the eyepoint to its reset position.

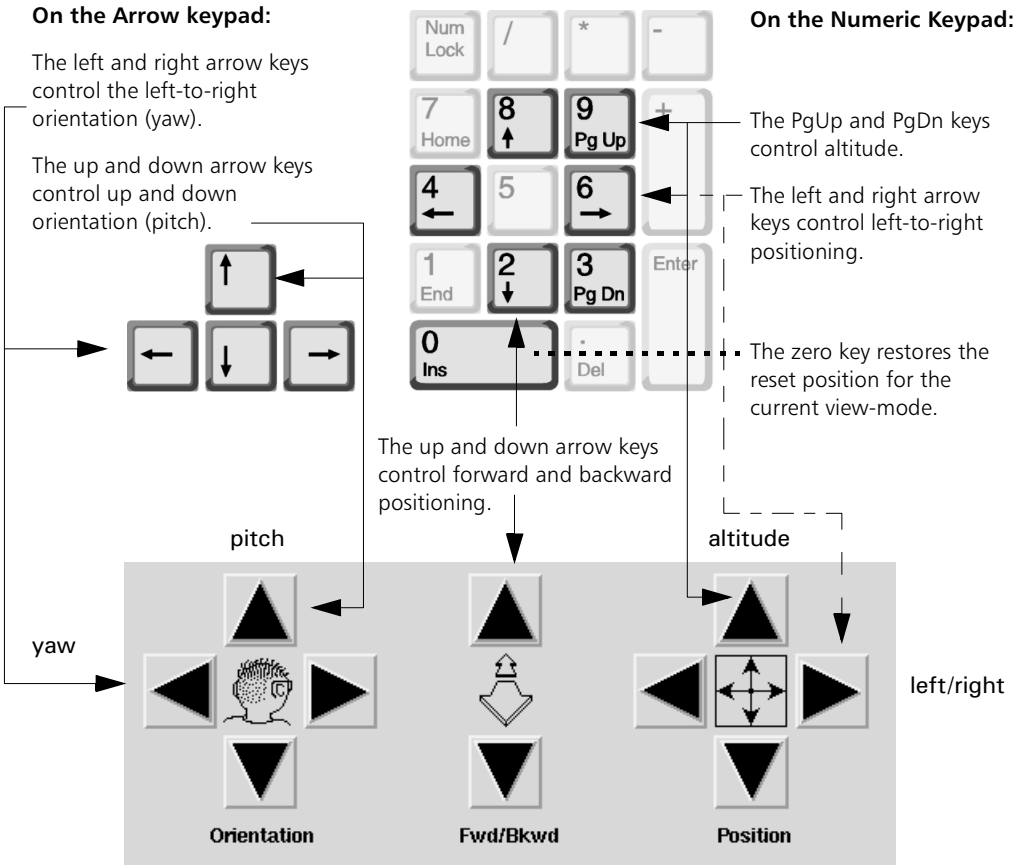


Figure 4-2. Orientation and position controls: keyboard and Stealth Control dialog box

Enabling the Keyboard Controls

In the Stealth for SGIs, the keyboard position and orientation controls work only when the graphics display window has focus.

On the Stealth for PCs, NumLock must be turned on for the keyboard controls to work correctly. On a dual-monitor system, the keyboard controls are enabled when the main control window has focus. In a single-monitor system with a graphics board that uses the Voodoo chipset, these controls are enabled whenever the graphics display is being viewed.

Adjusting Control Sensitivity

> To increase the sensitivity of the keyboard's positional controls, press the Home key.

> To reduce the sensitivity of the keyboard's positional controls, press the End key.

Note: Changing the sensitivity of the keyboard positional controls does not affect the controls in the Stealth Control dialog box. To change the sensitivity of the graphical controls, see "Adjusting the Sensitivity of Arrow Controls" on page 9-4.

4.2.2. Spaceball Controls (SGI only)

The SGI version of the Stealth supports the Spaceball input device from Spacetec IMC Corporation. The Spaceball gives you complete freedom of travel along three axes, plus pitch and yaw control.

> To increase the sensitivity of the Spaceball, press the 6 key.

> To decrease the sensitivity of the Spaceball, press the 7 key.

> To set the sensitivity of the Spaceball to the default values specified in *params.mtl*, press the 5 key.

For details on adjusting these defaults, see "Adjusting Spaceball Sensitivity (SGI only)" on page 9-6.

4.3. View-Modes

This section explains the Stealth view-modes and how the manual position and orientation controls work in each view-mode. This section also describes the default position, or reset position, for each view-mode.

4.3.1. Categories of View-Modes

The view-modes describe the attachment state of the Stealth and determine which of the orientation and position controls are active. The attachment states are:

- None
- One entity
- Two entities
- Group (multiple entities)

No attachment

In the Absolute or free-fly view-mode, the eyepoint is not attached to any entity. Manual controls let you place the eyepoint anywhere in the virtual world and control its orientation.

Attachment to one entity

In the following view-modes the eyepoint is dependent on the movements of a single entity

- Track
- Compass
- Orbit
- Tether
- Mimic
- Turret

Depending on the view-mode:

- The eyepoint position can be controlled by the entity's position.
- The eyepoint orientation can be controlled by the entity's position. The eyepoint remains at a fixed position and tracks a vehicle's movement.
- The position and orientation can both be controlled by the entity. For example, the eyepoint can be placed in a vehicle cockpit, traveling, turning, and banking with the vehicle.

Attachment to two entities

The following view-modes link the eyepoint position to a primary entity, while tracking a second entity:

- Tether track
- Mimic track

Attachment to a group of entities

The following view-modes let you define a group of entities and keep all members of that group constantly in view:

- Group
- Wide group

4.3.2. Positional Controls and Coordinate Frames

Depending on which view-mode you are using, the positional controls may move the eyepoint with respect to the terrain, or with respect to the attached entity. When the eyepoint moves with respect to the terrain, we describe it as movement in a topographic coordinate frame. When the eyepoint moves with respect to the entity, we describe it as movement in a body coordinate frame.

4.3.3. Absolute Mode

In Absolute, or free-fly mode, the Stealth is not attached to any entity. Position and orientation are controlled manually.

Controls	The position and orientation controls move the eyepoint as described in Figure 4-2, within a topographic frame. When moving forward or backward, altitude remains constant unless terrain following is enabled.
Reset Position	Return to the initial eyepoint position at Stealth startup.

4.3.4. Track Mode

In Track mode, the eyepoint's orientation is controlled by the attached entity. You control the eyepoint position manually. The eyepoint automatically follows the movements of the attached entity as if watching from a control tower, keeping it centered in the field of view.

Controls	The position controls move the eyepoint as described in Figure 4-2, in a topographic frame. Orientation controls are disabled.
Reset Position	Directly south of, and slightly above, the attached entity. The distance from the entity is calculated to allow the entire entity and some surrounding terrain to be visible. Orientation is set to 0,0,0 relative to the terrain's coordinate system.

4.3.5. Compass Mode

In Compass mode, the eyepoint's position and compass heading are dependent on the attached entity. This mode creates the effect of riding along with a vehicle while being solidly connected to it. This action is illustrated in Figure 4-3.

In Compass mode, the eyepoint position maintains a constant offset from the entity relative to the entity's own body coordinate frame.

Eyepoint orientation is affected by changes in the entity's yaw, pitch and roll.

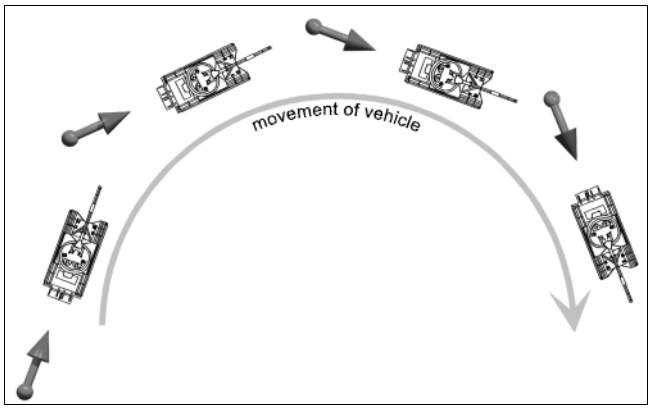


Figure 4-3. Tether mode

When you use the controls to change the eyepoint's position, it moves around the attached entity, along the surface of a sphere with the entity at its center. As the eyepoint changes position, its orientation changes automatically to keep the entity in view (unless you adjust the pitch offset so that this is no longer true).

When moving laterally, the eyepoint maintains a constant altitude and follows a circular path around a vertical axis as shown in Figure 4-4. Orientation is measured relative to the attached entity.

Controls

The position controls move the eyepoint left, right, up and down along the surface of the sphere. The forward/backward keys move the eyepoint away from or toward the entity, thereby enlarging or shrinking the sphere. The pitch controls let you add an offset to the eyepoint's pitch. The yaw controls are disabled.

Reset Position

Directly behind and slightly above the attached entity, at a distance that allows the entire entity to be fully visible. Orientation is set to 0,0,0 with respect to the entity

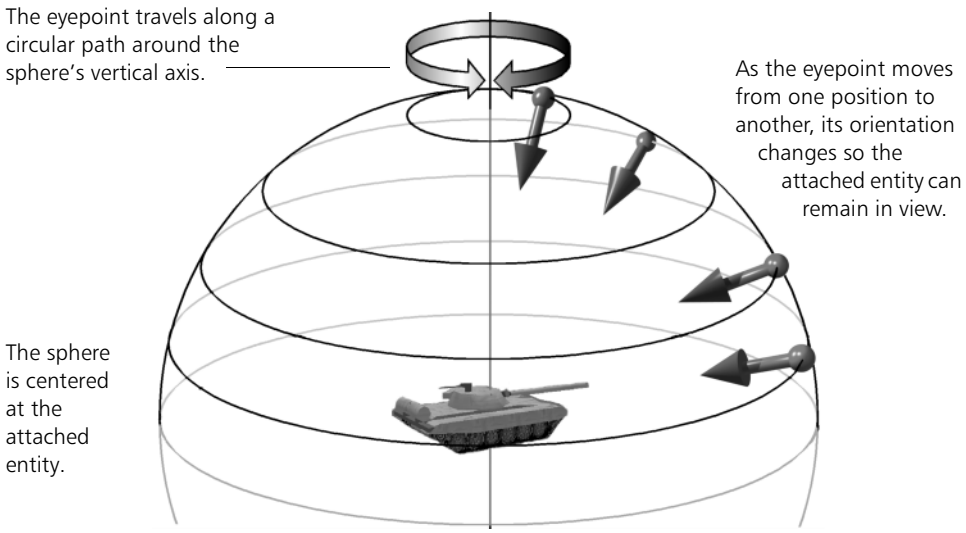


Figure 4-4. Eyepoint Movement and Orientation in Compass and Orbit Modes

4.3.6. Orbit Mode

In Orbit mode, the eyepoint revolves continuously around the entity at the speed you choose. This contrasts with Compass mode, in which the eyepoint stays in one place (relative to the entity) unless you move it manually.

In other respects, Orbit mode is very similar to Compass mode: the eyepoint's position and compass heading are dependent on the attached entity. The positional controls move the eyepoint in a spherical fashion around the attached entity, as illustrated in Figure 4-4. As the eyepoint changes position, its orientation changes automatically to keep the entity in view.

In Orbit mode orientation is measured relative to the terrain.

Controls	Same as for Compass mode, except that the left/right controls control orbit speed rather than lateral placement. You can use the c key to freeze the eyepoint (by switching to Compass mode), and use the b key to return to orbit mode.
Reset Position	Directly south of and slightly above the attached entity, at a distance that allows the entire entity to be fully visible. Orientation is 0,0,0 with respect to the terrain. Orbit speed is set to zero.

4.3.7. Tether Mode

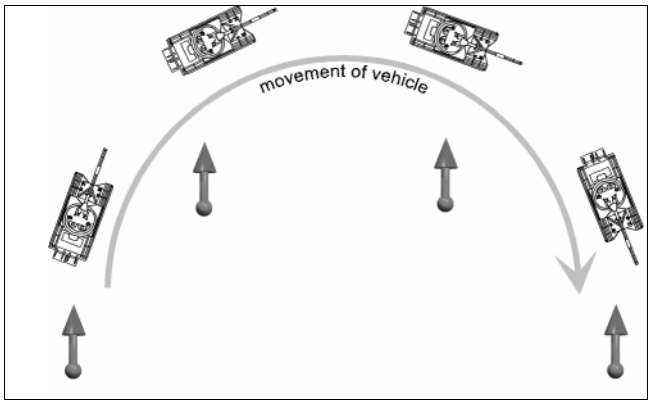
In Tether mode, the eyepoint's position is slaved to an attached entity. Orientation is controlled manually.

The controls move the eyepoint within a topographic frame, and let you place it at a desired position relative to the attached entity. For example, you might place the eyepoint 40 meters to the south of a vehicle. As the vehicle moves around the terrain, the eyepoint travels with the vehicle, maintaining a constant positional offset of 40 meters south. Figure 4-5 illustrates this movement by contrasting Tether mode with Compass mode. The arrow represents the location of the eyepoint with respect to the object being tracked.

Controls	Controls move the eyepoint as described in Figure 4-2, relative to the attached entity.
Reset Position	Directly south of and slightly above the attached entity, at a distance that allows the entire entity to be fully visible. Yaw and roll are set to zero with respect to the terrain, and pitch is set to -5.0 degrees, as determined by the viewStdPitch parameter in params.mtl.

In Tether mode, the eyepoint position maintains a constant offset from the attached entity within a topographic coordinate frame.

Eyepoint orientation is not affected by the entity's yaw, pitch and roll.



In Compass mode, the eyepoint position maintains a constant offset from the entity relative to the entity's own body coordinate frame.

Eyepoint orientation is affected by changes in the entity's yaw, pitch and roll.

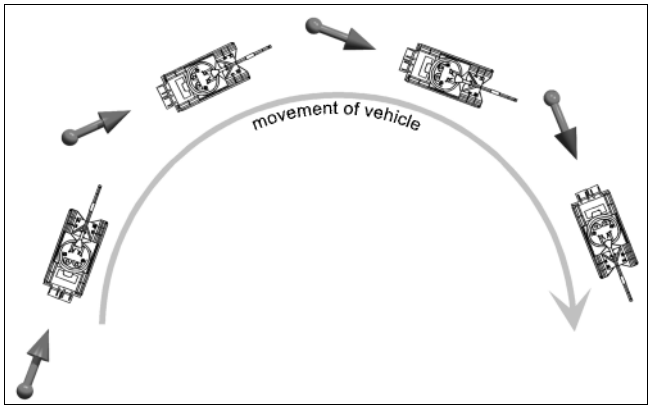


Figure 4-5. Eyepoint Behavior in Tether and Compass Modes

4.3.8. Mimic Mode

In Mimic mode, the eyepoint's position, heading, pitch, and roll are dependent on an attached entity. The eyepoint behaves as though it is rigidly connected to the entity. Use Mimic mode to create the effect of riding in a vehicle cockpit, or following a vehicle from an external location while connected to it by a solid, invisible rod.

The controls move the eyepoint with respect to the entity's body coordinate frame. For example, if you move the eyepoint to a location behind an attached vehicle, it will remain constantly behind the vehicle, regardless of the vehicle's path or direction on the terrain. When the eyepoint's yaw, pitch, and roll are zero, it has the same orientation as the attached entity.

Controls	Position and orientation controls move the eyepoint as described in Figure 4-2, but movement takes place within the attached entity's body coordinate frame.
Reset Position	Two meters above the attached entity's point of origin. Orientation is set to 0,0,0 with respect to the entity. With most vehicles, the reset position puts the eyepoint inside the cockpit, facing the front of the vehicle.

4.3.9. Turret Mode

Turret mode is similar to Mimic mode, in that both the eyepoint's position and orientation are slaved to an attached entity. However, in Turret mode the eyepoint is linked to the entity's first articulated part, rather than to the entity as a whole.

Typically, Turret mode is used to fuse the eyepoint to the turret of a tank, although you can use this mode with other entity types that have articulated parts. To work correctly, the first articulated part must rotate around axes that correspond with the axes of its host entity.

Controls	Position and orientation controls move the eyepoint as described in Figure 4-2, but movement takes place within the articulated part's coordinate frame.
Reset Position	Two meters above the attached entity's (not the part's) point of origin. Orientation is set to 0,0,0 with respect to the part.

4.3.10. Tether Track Mode

Tether Track mode lets you monitor the activities of a pair of entities. Eyepoint position and orientation are determined by the position of two entities in relation to each other.

In this mode, you designate a primary and a secondary entity. The eyepoint's coordinate frame is based on a ray running from the primary entity to the secondary entity, as shown in Figure 4-6. When the eyepoint is aimed along this ray, its heading is zero.

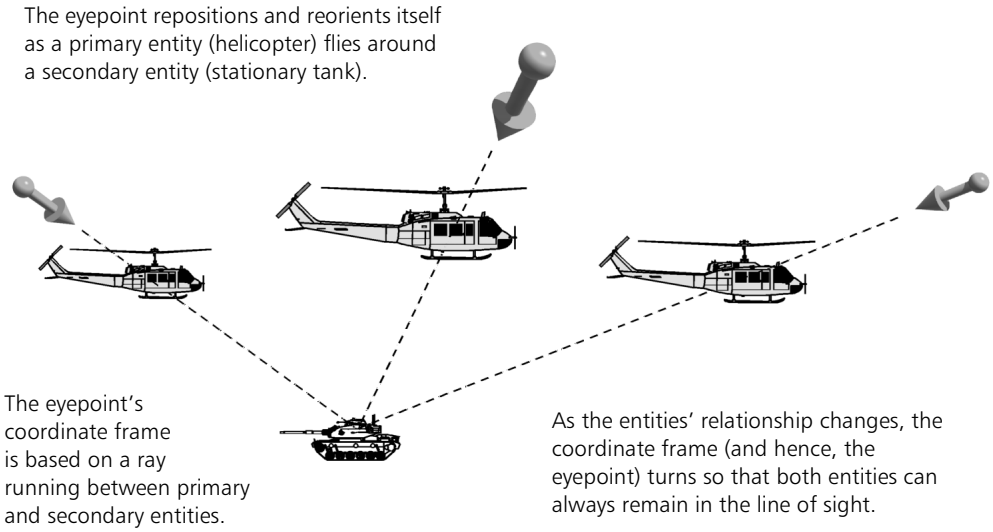


Figure 4-6. Eyepoint Behavior in Tether Track Mode

As the eyepoint moves with the entities, its roll is locked at zero degrees with respect to the terrain. The secondary entity always remains centered in the field of view.

Controls	The left/right controls move the eyepoint left and right within the coordinate frame defined by the ray connecting the primary and secondary entities. The altitude controls increase or decrease eyepoint altitude within this frame. The forward/backward controls slide the eyepoint forward or backward along the line of sight. The orientation controls are disabled.
Reset Position	Slightly higher than the primary entity, positioned and oriented so that both primary and secondary entities are fully visible. Yaw is zero and pitch is -5.0 degrees with respect to a ray connecting the primary and secondary entity. Roll is zero with respect to the terrain.

4.3.11. Mimic Track Mode

Mimic Track mode lets you simulate the effect of sitting in the cockpit of one vehicle while tracking another vehicle. You designate a primary (attached) entity which determines eyepoint position, and a secondary (tracked) entity to determine eyepoint orientation.

The eyepoint maintains a roll of zero with respect to the primary entity, which creates the effect of riding in that entity's cockpit. Pitch and yaw are determined by the position of the secondary entity, which remains centered in the field of view.

Controls

The forward/backward controls move the eyepoint forward or backward along the line of sight. The altitude controls increase or decrease eyepoint altitude with respect to the primary entity's body coordinate frame.

The left/right controls move the eyepoint left and right along the surface of a sphere with the secondary entity at its center. Movement is similar to left-to-right movement in Compass mode (section 4.3.5), except that the eyepoint revolves around an axis which is vertical with respect to the primary entity, not vertical with respect to the terrain.

The orientation controls are disabled.

Reset Position

Two meters above the primary entity's point of origin. Roll is set to zero with respect to the primary; pitch and yaw are set so that the secondary entity is centered in the field of view.

4.3.12. Group and Wide Group Modes

In Group and Wide Group modes, the eyepoint is positioned to keep all members of a specified entity group within view. In Group mode, you can move the eyepoint around the group to view it from any direction. In Wide Group mode, the eyepoint is positioned for a broadside view of the group, so the entities are spread as widely as possible across the field of view.

In Group mode, the left and right positional controls move the eyepoint in a path around the group's midpoint, in a manner similar to Compass mode ("Compass Mode" on page 4-8). As it moves around the group, the eyepoint may move closer to or farther from the group's midpoint as needed to obtain the best view of all entities. Therefore, its path is not truly circular as it is in Compass mode. In Wide Group mode, the left and right positional controls are not used, since position and orientation are set automatically to maintain a broadside view.

In either mode, as entities in the view-group move around in the terrain, the eyepoint's position, orientation, and distance from the group are adjusted automatically to provide a view of all members.

To define a view-group, you can select entities in the graphics display using the mouse (SGI only), pick entities from a list, or use the keyboard. For more information about defining view-groups, see "Attaching the Stealth to An Entity" on page 5-2.

Controls

In both group modes, the forward/backward controls move the eyepoint forward and backward, toward or away from the group's midpoint.

The other positional controls move the eyepoint along the surface of a sphere centered at the group's midpoint. The altitude controls move the eyepoint up and down along the sphere; the left/right controls (disabled in Wide Group mode) move the eyepoint left and right along the sphere.

In both group modes, all orientation control are enabled. However, using these controls may cause some members of the view-group to fall out of view.

Reset Position

Group Mode

Pointing north, and positioned far enough south of the view-group to allow all members to be visible.

Wide Group Mode

Positioned to one side of the group's greatest dimension (that is, the greatest distance between any two member entities). The eyepoint is oriented toward the group's midpoint, and maintains the distance needed to keep the entire group in view.

4.4. Selecting View-Modes

To select a view-mode, use one of the following methods:

> In the Stealth Control window, select the view-mode.

> Press the key or key combination for the view-mode as listed in Figure 4-7.

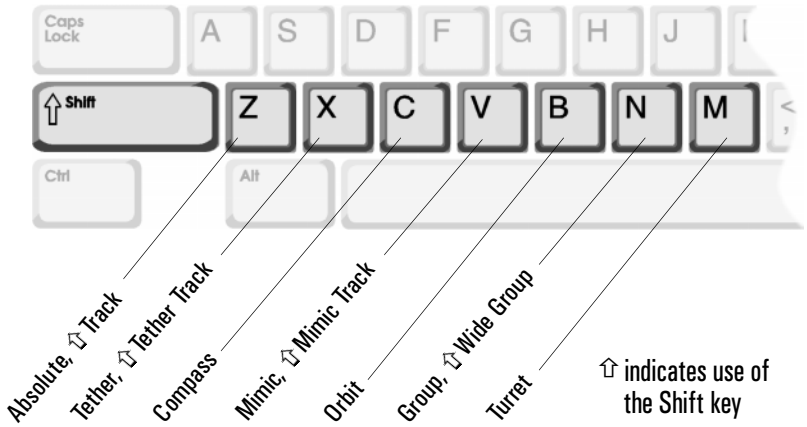


Figure 4-7. Keys for Selecting View-Modes

4.5. Viewing an Exchange of Munition Fire

The Stealth can change its attachment and view-mode automatically to provide a good view of all entities involved in the exchange of fire. To enable the Munition Attach feature:

1. On the Stealth main control window, click Stealth Control. The Stealth Control dialog box opens.
2. Select an option on the Fire Action drop-down list (Figure 4-8.)

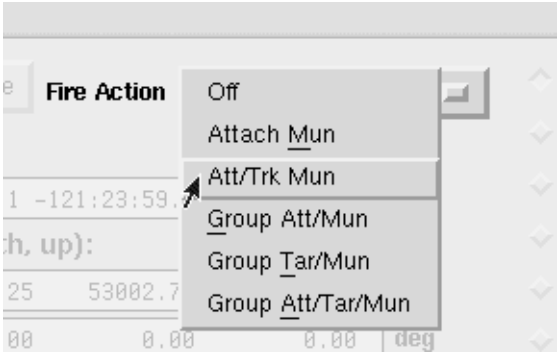


Figure 4-8. The Fire Action Menu

The eyepoint can respond to a fire message in one of six ways:

Table 4-1: Fire Action Options

Fire Action	Parameter Value	Description
Off	0	No response.
Attach Mun	1	Attach to the munition.
Att/Trk Mun	2	Remain attached to the attacker; track the munition.
Group Att/Mun	3	View a group consisting of the attacker and munition.
Group Tar/Mun	4	View a group consisting of the target and the munition.
Group Att/Tar/Mun	5	View a group consisting of the attacker, target, and munition.

These responses will occur only when the attached entity is the attacker and when the Stealth is in one of the following view modes:

- Track
- Compass
- Orbit
- Tether
- Mimic
- Turret

Sometimes, a munition entity will not come into existence until a short time after its associated fire event. If the munition enters the exercise within a certain time threshold after the fire event, the view-mode change occurs as soon as the munition is found. This time threshold is five seconds by default, and is determined by the **viewFiredWaitTime** parameter in *params.mtl*.

> To enable Munition Attach by default, edit the **viewFiredMode** parameter. Set the parameter to a value between 0 and 5, as indicated in Table 4-1.

4.6. Saving and Recalling View-States

You can save up to 8 view states for later recall. A view state saves the following information:

- View-mode
- Object ID for the attached entity
- Positional offset.

4.6.1. Saving A View State

To save the current view state:

1. On the Stealth main control window, click Stealth Control. The Stealth Control dialog box opens.
2. Choose Save View from the menu at the bottom of the dialog box.
3. Click the numbered button that you want to assign to the current view state.

> To save a view state from the keyboard, press Shift-"number key" (1 through 8 on the top row on the keyboard.)

Notes

- There is no indication in the interface of the characteristics of a saved view state.
- View states saved using Save View are saved only for the current session of the Stealth. To save a view state for future sessions, you must save it to a file. See "Saving View States to A File" on page 4-19.

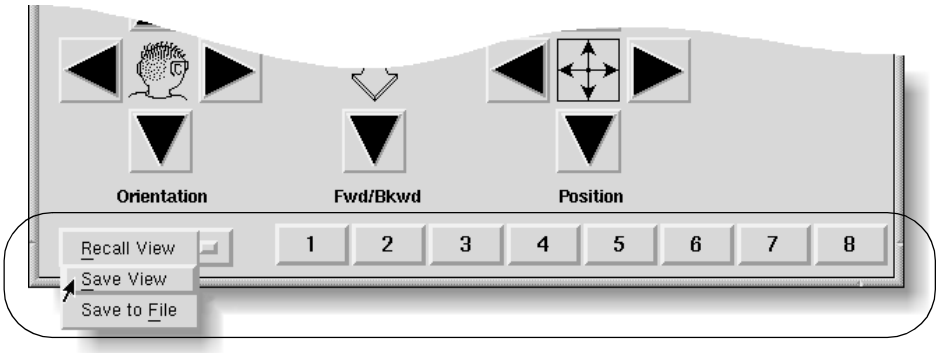


Figure 4-9. Saved View-State Menu and Buttons

4.6.2. Recalling a Saved View State

> To recall a view state, click on the appropriate number in the Stealth Control dialog box. [Keyboard: number key for saved state]

4.6.3. Saving View States to A File

> To store saved view states for future sessions, choose Save to File from the menu at the bottom of the Stealth Control dialog box. [Keyboard: F3 saves view-states]

The Stealth writes the view state information to *viewsave.mtl*, a configuration file that the Stealth loads at startup.

Note: If a saved view state involves an attachment to a particular entity, you will not be able to recall that view state unless that entity (or an entity with the same ID) exists.

4.6.4. Saving an Initial Start Position (SGI only)

At startup, the Stealth's initial eyepoint position is determined by location information stored in the *startPosition.mtl* configuration file.

To save a new start position:

1. Move the eyepoint to the desired position.
2. Press the O (letter) key.

4.7. View-Mode Quick Reference

Table 4-2 summarizes essential characteristics of the view-modes.

Table 4-2: Summary of Stealth view-modes (Sheet 1 of 2)

View-Mode	Entities	Key	Description
Absolute	0	z	Free-fly mode. Eyepoint position and orientation are controlled manually. (see "Absolute Mode" on page 4-7)
Track	1	Z	Lets you track an entity from a desired location. Position is set manually; orientation is controlled by the entity being tracked. (see "Track Mode" on page 4-8)
Tether	1	x	Eyepoint moves in tandem with the attached entity, keeping a constant distance from the entity, in a constant direction (for example, 40m. to the south). (see "Tether Mode" on page 4-11)
Compass	1	c	Position and heading are dependent on the attached entity. The controls move the eyepoint along the surface of a sphere centered at the attached entity. You control the eyepoint's longitude and latitude on the sphere, and its distance from the entity. The Stealth adjusts orientation automatically to keep the entity in view. (see "Compass Mode" on page 4-8)
Mimic	1	v	Creates the effect of being inside the entity, or rigidly connected to it. Eyepoint position and orientation are both slaved to the entity. (see "Mimic Mode" on page 4-12)
Orbit	1	b	Position and heading are dependent on the attached entity. The eyepoint continually orbits along the surface of a sphere centered at the attached entity. You control the eyepoint's orbit speed, latitude, and distance from the entity. The Stealth adjusts orientation automatically to keep the entity in view. (see "Compass Mode" on page 4-8)
Turret	1	m	Same as Mimic mode, but the eyepoint is slaved to the attached entity's first articulated part, rather than to the entity as a whole. Typically used to fuse the eyepoint to the turret of a tank. (see "Turret Mode" on page 4-12)
Tether Track	2	X	Monitors the activities of a pair of entities. The eyepoint points along a ray that connects the two entities, so that both entities can remain in view. (see section 4.3.10)
Mimic Track	2	V	Creates the effect of sitting in one entity while tracking another. (see "Mimic Track Mode" on page 4-14)

Table 4-2: Summary of Stealth view-modes (Sheet 2 of 2)

View-Mode	Entities	Key	Description
Group	1 or more	n	Shows all entities in a user-defined view-group. You can view the group from any direction. (see "Group and Wide Group Modes" on page 4-15)
Wide Group	1 or more	N	Shows all entities in a user-defined view-group. The eyepoint is positioned broadside to the group, so the entities are distributed as widely as possible across the field of view. (see "Group and Wide Group Modes" on page 4-15)

Working with Entities and Aggregates

This chapter describes how to get information about entities and how to attach the Stealth to entities and aggregates.

Topics include:

- Attaching the Stealth to An Entity, on page 5-2
- Attaching the Stealth to A View Group, on page 5-5
- Viewing Information About an Attached Entity, on page 5-7
- Working With Aggregates (SGI Only), on page 5-8

5.1. Attaching the Stealth to An Entity

As stated in "What is the Eyepoint?" on page 4-2, the eyepoint is the place from which you view the virtual world. The view-mode determines the relationship between the eyepoint and an attached entity. You can attach the Stealth to an entity in one of the following ways:

- Select one or more entities from pick-lists in the Entities in Exercise dialog box.
- Use the keyboard to attach to each entity in sequence.
- Click the desired entity or entities in the graphics display (SGI only).

Note: All the procedures for attaching the Stealth to an entity apply to attaching the Stealth to an aggregate. For information about other aspects of working with aggregates, see "Working With Aggregates (SGI Only)" on page 5-8.

5.1.1. Attaching to Entities Using the Entities in Exercise Dialog Box

The Entities in Exercise dialog box ("Entities in Exercise Dialog Box" on page 3-16) lets you choose primary and secondary attachments, and manage the view-group.

The left side of the window contains a list that shows all entities and aggregates detected by the Stealth, sorted by entity ID (Figure 3-7). To attach the eyepoint to an entity:

1. Click the List of Entities button in the Stealth control window. The Entities in Exercise dialog box opens.
2. Select an entity in the Entities in Exercise list.
3. Click the Attach button to designate it as the primary entity, or the Track button to designate it as the secondary entity.

Swapping Primary and Secondary Entities

> To swap the primary and secondary entities, click the Swap Primary/Secondary button.

Toggling the Display of Entities On and Off (SGI only)

You can turn the display of entities in the Entities List on and off. This allows you to separate listing of entities from listing of aggregates.

> To toggle the listing of entities on or off, select or clear the List Entities check box.

> To set the default state for the List Entities check box, set the **StApplication::theListEntitiesDefault** parameter in the *params.mtl*. file.

```
setqb StApplication::theListEntitiesDefault n
```

To set the listing of entities on, set *n* to 1. To set it to off, set *n* to 0.

5.1.2. Attaching to Entities Using the Keyboard

You can use keyboard controls to select primary and secondary entities and choose entities in the view-group. The attachment keys work only when the cursor is over the graphics display, giving it focus (SGI), or when the main control window has focus (PC).

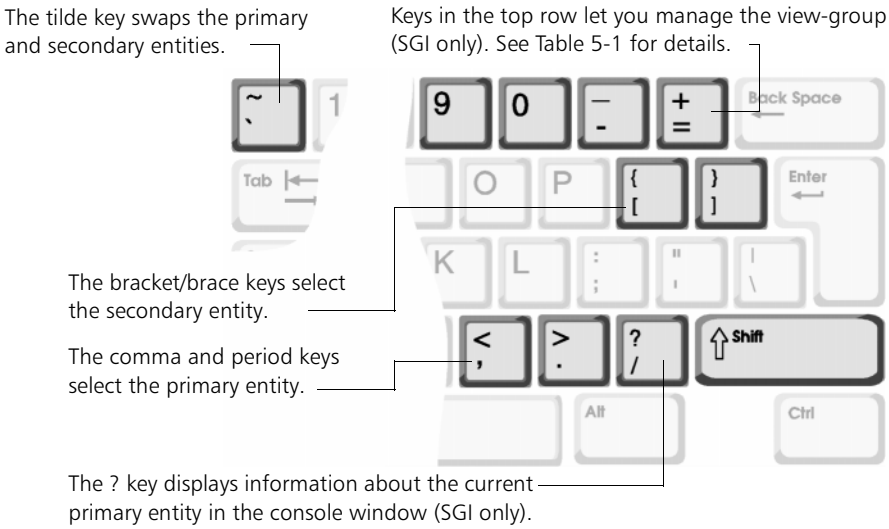


Figure 5-1. Entity Attachment Keys

If you choose a primary entity while in Absolute, Group or Wide Group mode, the Stealth switches to the most recently-used view-mode that uses a single attached entity. Likewise, if you choose a secondary entity, the Stealth switches to a view-mode that requires a primary and secondary entity (Tether Track or Mimic Track).

> To determine which entity is currently attached, look at the entity identifier readouts in the Heads-Up Display, or open the Info on Attached Entity dialog box.

On SGI systems, you can press the ? (question mark) key to display entity information in the Stealth's console. For more information on how to view entity information, see section 5.3.

Using the Keyboard to Choose Primary and Secondary Entities

> To select the primary entity, use the period and comma keys. The period key scrolls through all entities in order by Entity ID. The comma scrolls through the list in reverse order. As you scroll the list, the eyepoint attaches to each entity in sequence.

> To select the secondary entity, use the bracket keys ([and]). The right bracket scrolls through all entities in order by Entity ID; the left bracket scrolls in reverse order.

> To scroll through air vehicles only, hold down the Shift key while scrolling.

> To swap the primary and secondary entities, press the tilde (~) key.

5.1.3. Attaching to Entities Using the Mouse (SGI only)

> In the SGI version, you can attach entities by clicking on them in the graphics display.

The right button works differently in group and non-group view-modes.

In all modes:

- A left-click defines the entity as the primary attachment.
- A middle-click adds the entity to the view group.

In non-group modes a right-click defines the entity as the secondary attachment.

In group modes a right-click removes the entity from the view-group.

5.2. Attaching the Stealth to A View Group

You can put entities into a view group and attach the Stealth to the group. View groups exist only within the Stealth; they have no visibility to participants in a simulation. They are a convenience for working with a subset of the total list of entities. If the Stealth is attached to the group, it tries to keep all of the entities visible in the Stealth window.

The Attach and Track buttons under the View Group list affect entities selected in the list in the same way that the same buttons under the Entity list affect entities in that list.

5.2.1. Adding Entities to A View Group

To add a single entity to the view group:

1. Click the List of Entities button in the Stealth control window. The Entities in Exercise dialog box opens.
2. Select an entity in the Entities in Exercise list.
3. Click the Add to Group button. The Stealth adds the entity to the Entities in View Group list on the right side of the window (Figure 5-2).

> To add all existing entities to the view-group, click the Add All Entities to Group button.

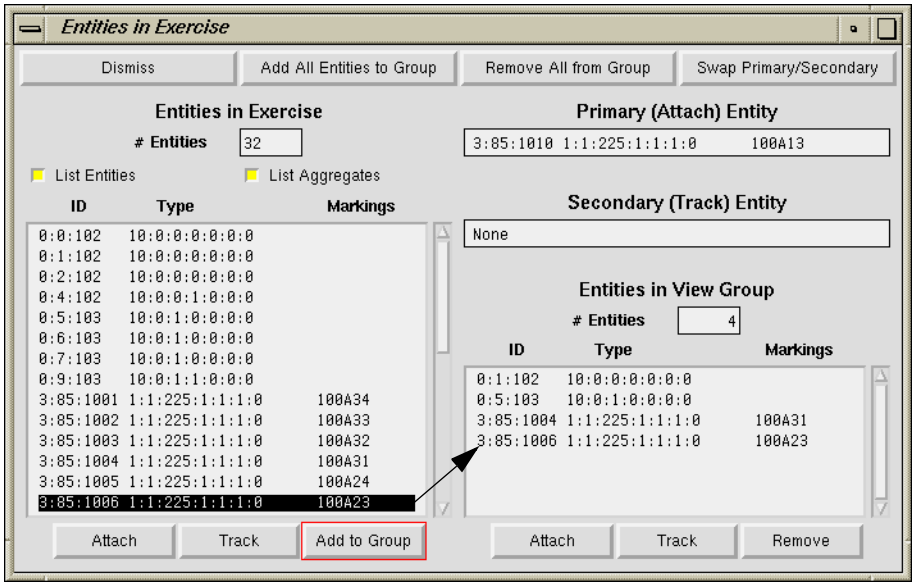


Figure 5-2. List of View-Group members

5.2.2. Removing Entities From A View Group

To remove an entity from the view group:

1. Click the List of Entities button in the Stealth control window. The Entities in Exercise dialog box opens.
2. Select an entity in the Entities in View Group list.
3. Click the Remove button.

> To remove all entities from the view group, click the Remove All From Group button.

5.2.3. Using the Keyboard to Manage the View-Group (SGI only)

You can manage groups from the keyboard on SGI systems. Table 5-1 lists the keys to press for different tasks:

Table 5-1: Keyboard controls for managing groups

View-mode	Task	Key
All except Absolute, Group, Wide Group	Add primary entity to view group	+ (plus)
	Remove primary entity from view group	- (minus)
All view-modes	Add all entities to view group	9
	Add air vehicles to view group	Shift/9
	Remove all entities from view group	0 (zero)

Note: Only the keys on the top row of the main keyboard affect the view-group, not the corresponding keys on the numeric keypad.

5.3. Viewing Information About an Attached Entity

> To view information about the entity that the Stealth is attached to, on the Stealth main control window, click Attach Ent. Info.

The Info on Attached Entity dialog box opens (Figure 3-6.)

The dialog box is read-only, but you can change the coordinate system used to describe the entity's position, velocity, acceleration, orientation, and angular velocity.

> To change the display coordinates, select an option on the Display Coords drop-down list.

The choices are:

- Geocentric coordinates
- Database coordinates
- Body coordinates

5.3.1. Other Sources of Entity Information

If the Heads-Up Display is turned on, the entity ID and marking type of the current primary entity appears in the graphics display.

> To display information about the primary entity in the console window, press the question mark key. (SGI only)

Figure 5-3 illustrates the display of information about the primary entity.

Information about the primary attached entity appears in the Heads-Up Display. In the SGI version, the ? key displays additional information in the Stealth's console.

```
Entity Type: 1:2:225:2:1:0:0
lat lon alt: 36.864896 -121.399977 526.4
position:                0.4        24.9       526.4
velocity:                0.0         0.0         0.0
accel:                   0.0         0.0         0.0
orientation:        6.208014 -12.118988 -37.489747
rotation:           0.000000   0.000000   0.000000
```

Figure 5-3. Entity Information in the Heads-Up Display and Console

5.4. Working With Aggregates (SGI Only)

An aggregate is:

- A group of entities
- A group of other aggregates (a group of groups)
- A group of entities and aggregates

Unlike view groups, which are specific to the Stealth, aggregates are part of DIS and the HLA RPR FOM. Information about aggregates is sent out with PDUs and HLA state messages. State information includes the position, velocity, orientation, and makeup of the aggregates.

You can attach the Stealth to aggregates just as you would attach to entities. (See "Attaching the Stealth to An Entity" on page 5-2.) When you attach the Stealth to an aggregate, all the view modes are available and the Stealth behaves just as if you were attached to an individual entity.

5.4.1. Aggregate Hierarchies

Aggregates can be organized into hierarchies to represent the organization of the entities in an exercise. For example, personnel could be organized into squads, platoons, companies, divisions, and so on. This hierarchy could be represented in your aggregates. Figure 5-4 illustrates an aggregate hierarchy, various permutations of aggregates, and their associated levels.

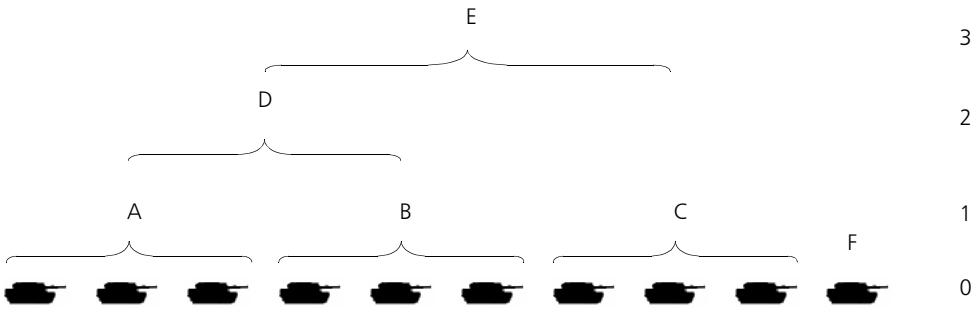


Figure 5-4. Aggregate hierarchy

In Figure 5-4, the entities are at Level 0. This is always the case. (Although you can create an empty aggregate at Level 0, such an object would have little value.) Aggregates A, B, and C are composed of entities. They are at Level 1. Entity F is not part of an aggregate. Aggregate D is composed of aggregates A and B. Aggregate D's root is at Level 2. Aggregate E is composed of aggregates D and C. Its root is at Level 3. In this illustration, Level 3 is the highest level. Both aggregate D and aggregate E have aggregates nested in them.

Understanding the interplay of aggregate hierarchies and their root levels will allow you to use the Aggregate Options section of the Stealth Options dialog box properly and avoid unanticipated consequences of your settings.

5.4.2. Displaying Aggregates

Aggregates are listed in the Entities in Exercise dialog box (Figure 3-7) along with individual entities.

> To toggle display of aggregates in the Entities in Exercise dialog box on or off, select or clear the List Aggregates checkbox.

> To display only aggregates in the Entities list, clear the List Entities checkbox.

You can set the default state for displaying aggregates.

To specify the default state for displaying aggregates, set the **StApplication::theListAggregatesDefault** parameter in the *params.mtl* file.

```
setqb StApplication::theListAggregatesDefault n
```

Set *n* to 1 to list aggregates, 0 to not list them.

5.4.3. Aggregate Symbology

Aggregates are displayed in the Stealth as a translucent enclosure with an aggregate icon. Both the enclosure and the icon are based on Multigen models and are completely configurable. The illustrations in this section represent an implementation by MÄK, however the enclosures and icons used in your implementation could be completely different.

Figure 5-5 illustrates display of an aggregate. The box encloses the entities that make up the aggregate. The icon indicates the type of entities in the aggregate. Beneath the icon is the health meter. The health meter represents the status of the aggregate's firepower and mobility as a spectrum from green, for perfect condition, through yellow (mobility kill) and orange (firepower kill), to red for no firepower or mobility. For information about how to program the health meter, see "Programming the Aggregate Health Meter" on page 11-16.

The size of the icon is scaled to reflect the level of the hierarchy. Icons always face the viewer, regardless of the orientation and position of the aggregate.

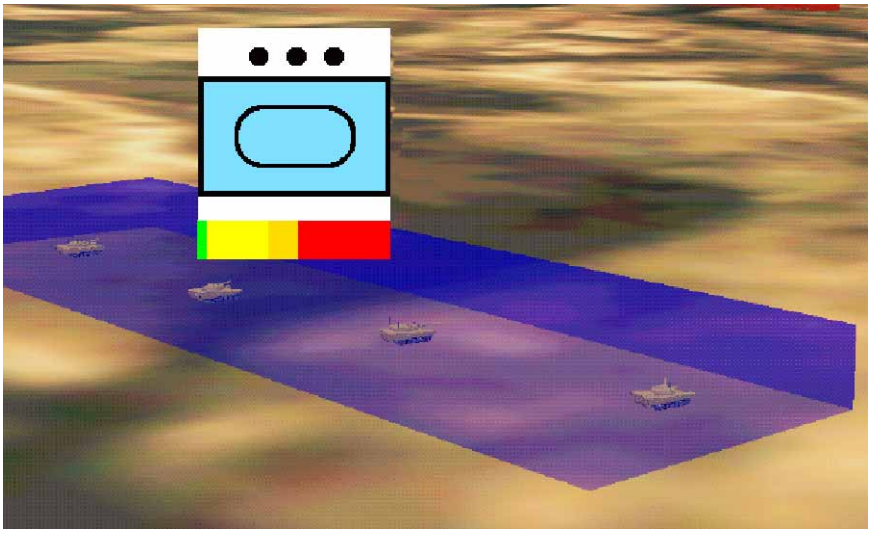


Figure 5-5. Aggregate enclosure and icon

Note: For information about how to configure aggregate symbols, see "Mapping Aggregate Symbols" on page 11-13.

5.4.4. Setting Options for Displaying Aggregates

The Stealth Options dialog box has several controls for displaying aggregates (Figure 5-6), as follows:

- Highest Level - The top hierarchical level that is displayed.
- Highest Only - Display only those aggregates that are rooted at the highest level.
- Nested Aggregates - Display nested aggregates within their parent aggregate.
- Nested Entities - Display entities within an aggregate.
- Altitude Controlled - Change the Highest Level setting based on the altitude of the viewpoint.

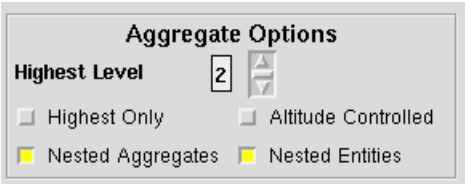


Figure 5-6. Aggregate controls

The following sections explain these options. Figure 5-7 is the basis for the explanations in the following sections. It is a different view of the aggregates displayed in Figure 5-4. Each aggregate is enclosed in a box, as if this were a Stealth display.

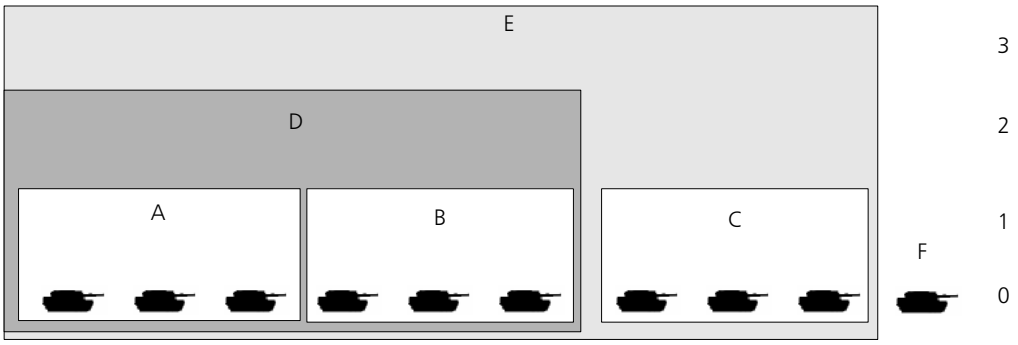


Figure 5-7. Aggregate hierarchy

Highest Level

Figure 5-7 has four levels (0-3). The Highest Level control determines the highest level of aggregation that is displayed in the Stealth. If you specify 3, all the aggregates in Figure 5-7 are displayed. If you specify 1, only aggregates A, B, and C are displayed (Figure 5-8). Aggregates D and E are still part of the exercise, but are not displayed in the Stealth.

Figure 5-8. Highest Level set to 1

> To change the highest level aggregate displayed, click the up and down arrows for the Highest Level field. [Keyboard: q = up arrow; a = down arrow]

Highest Only

If you specify Highest Only, the Stealth displays only those aggregates whose root is at the highest level. For example, if Highest Level is 3, setting Highest Only would cause the Stealth to display aggregate E (Figure 5-9). If the Highest Level is 2, only aggregate D is displayed (Figure 5-10). Aggregate C, although part of an aggregate that is at Level 3, is not displayed, because its root is not at Level 2.

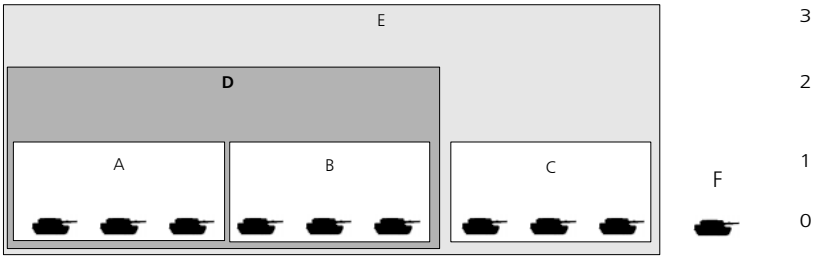


Figure 5-9. Highest Only when Highest level is 3

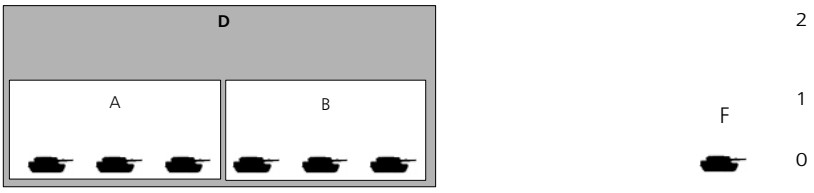


Figure 5-10. Highest Only when Highest Level is 2

Nested Entities and Nested Aggregates

You can specify whether or not to display the entities and aggregates that make up aggregates. If you display nested entities and aggregates, you see them within their aggregate enclosures. If you turn off the display, you only see the aggregates at the highest level of each hierarchy.

> To turn display of nested entities on or off, select or clear the Nested Entities check box.

Figure 5-11 illustrates Nested Entities turned off. The Stealth displays the aggregates, but not their entities. Entity F is displayed, because it is not part of an aggregate.

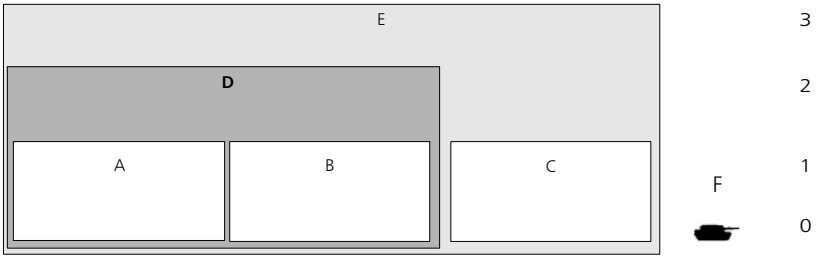


Figure 5-11. Nested Entities off

> To turn display of nested aggregates on or off, select or clear the Nested Aggregates check box. [Keyboard: Q toggles nested aggregates on and off]

Figure 5-12 illustrates Nested Aggregates turned off, Highest Level set to 2, and Highest Only unchecked. The Stealth displays aggregates D and C, but not A and B. A and B are nested in D, so are not displayed. Aggregate C is displayed because it is below Level 2. If Highest Only was checked, Aggregate C would not be displayed, because it is part of Aggregate E, which is above the current setting for Highest Level.

Figure 5-12. Nested Aggregates off, Highest Level 2

Altitude Controlled

If you select Altitude Controlled, the highest level controls are overridden. Aggregates are displayed based on the altitude of the viewpoint. Altitudes are configured in a configuration file. As the viewpoint moves through these altitudes, successive levels of aggregates are displayed.

Figure 5-13 illustrates display of aggregates controlled by altitude. The Stealth is configured to display successive levels at 600 meter intervals. If the viewpoint is between 1200 and 1800 meters, the aggregates at Level 2 are displayed.

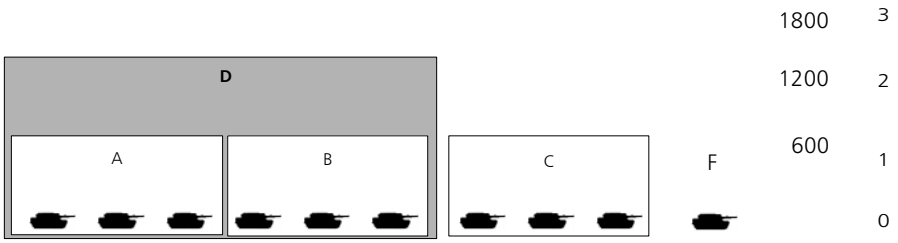


Figure 5-13. Altitude Controlled aggregate display, 1200-1800 meters

> To turn altitude control on or off, select or clear the Altitude Controlled check box. [Keyboard: A toggles altitude control on and off]

> To set the altitude at which the Stealth changes the Highest Level for viewing aggregates, set the **agg-altitude** parameter in the **params.mtl** file.

`(agg-altitude` a_1 a_2 `...` a_n`)`

a_1, a_2, through a_n are the altitudes, in meters, at which the Stealth changes the Highest Level.

Display Features

This chapter describes features that control the appearance of the virtual world, and of the Stealth. Some of these features are available only in the SGI version. Topics include:

- The Heads-Up Display, on page 6-2
- Electromagnetic Sensor Volumes (SGI and DIS only), on page 6-7
- Visual Options Common to Stealth for SGIs and PCs, on page 6-14
- Filtering Out Distant Entities, on page 6-20
- Visual Options Available Only On Stealth for SGIs, on page 6-21
- Clouds, on page 6-30
- Displaying Multiple Views (SGI only), on page 6-31

6.1. The Heads-Up Display

The Heads-Up Display, also called the overlay, is a set of indicators and readouts superimposed onto the Stealth graphics display (Figure 6-1). It displays the state of the eyepoint and the locations of other entities.

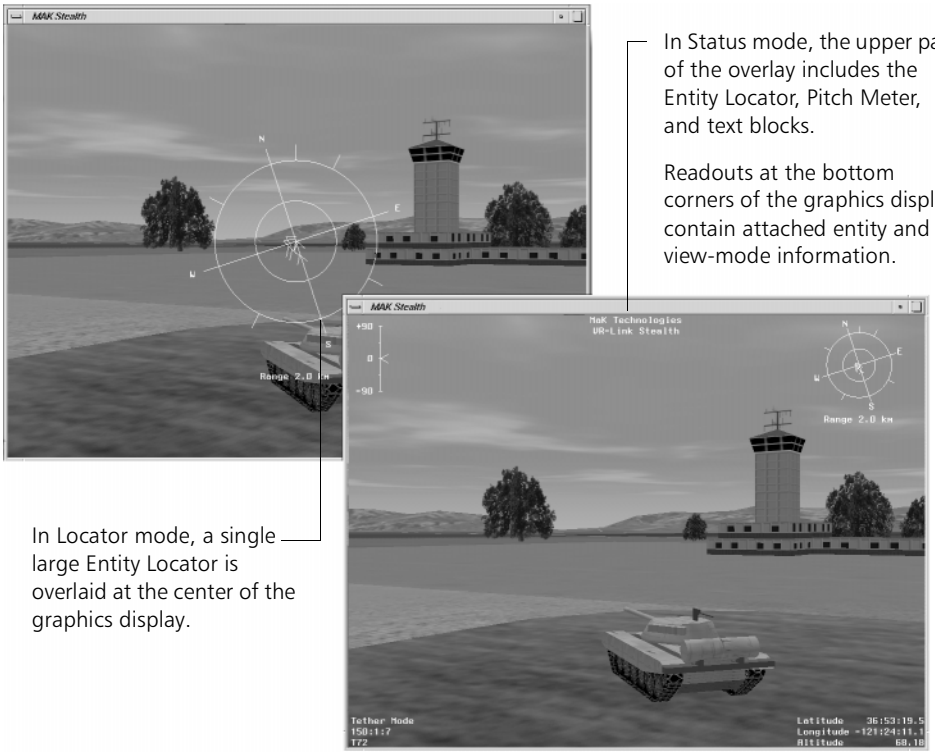


Figure 6-1. Heads-Up display

6.1.1. Choosing an Overlay Mode

The overlay may be in one of the four modes described in Table 6-1.

Table 6-1: Overlay modes

Overlay	Description
Off	No overlay.
Text	One or two blocks of text strings appear at user-specified locations. Initially, a single text block appears at the graphics display's top center.
Status	The user-defined text blocks described above, plus: - A Pitch Meter in the graphics display's upper left corner. - The Entity Locator in upper right corner. - Attached entity data in the lower left corner. - Latitude, longitude, orientation data in the lower right corner.
Locator	A large Entity Locator appears at the center of the graphics display.

> To choose an overlay mode, select it from the Overlay drop-down list on the Stealth Options dialog box. [Keyboard: F4 (on and off)]

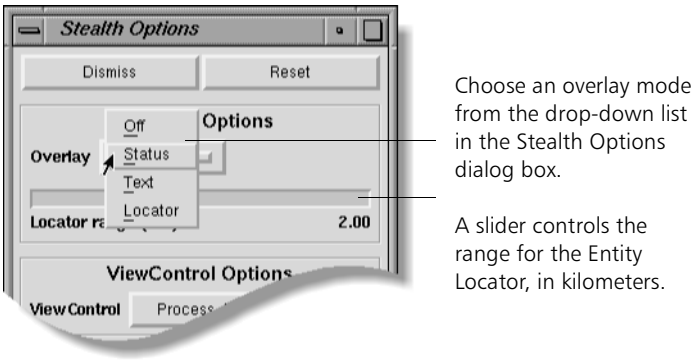


Figure 6-2. The Overlay drop-down list

Changing the Default Overlay Mode

> To specify the Stealth's initial overlay mode, edit the **overlayMode** parameter in the *params.mtl* configuration file as shown:

```
(setqb overlayMode n)
```

Set *n* to 0 for Off, 1 for Status, 2 for Text, or 3 for Locator.

6.1.2. Using the Entity Locator

The Entity Locator performs several functions, as illustrated in Figure 6-3:

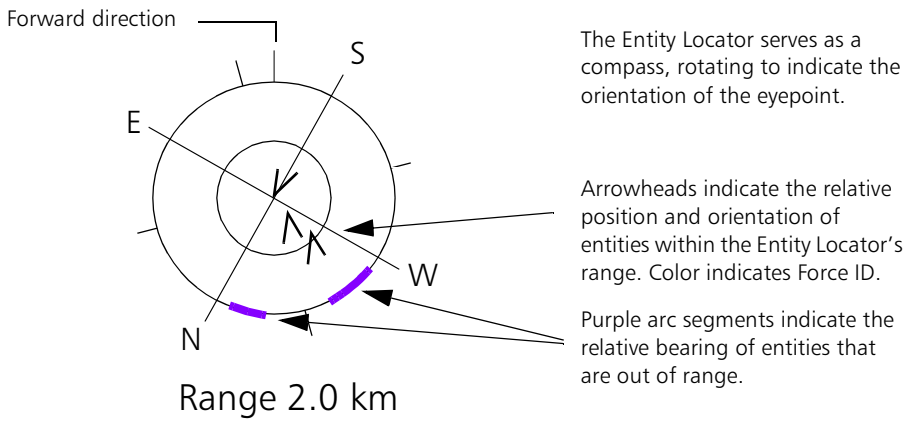


Figure 6-3. The Entity Locator

The locator covers a range of two kilometers by default.

> To specify the range of the Entity Locator, adjust the Locator Range slider in the Stealth Options dialog box (Figure 6-2).

If an entity is within the range of the locator's outer circle, it appears as an arrowhead oriented along the entity's heading. The arrowhead color indicates the entity's Force ID as follows:

- White for friendly
- Red for enemy
- Green for other

If an entity is out of range, a segment of the outer ring turns purple to show the entity's relative bearing.

6.1.3. Customizing the Overlay

You can customize the following aspects of the overlay by editing parameters in *params.mtl*:

- Colors
- Opacity
- The contents, position, and appearance of the text blocks.

Modifying Text Blocks

In Text and Status modes, the Stealth can display two blocks of text containing up to four lines each. By default, the Stealth displays a two-line block at the top-center of the graphics display; the other text block contains no lines.

To modify the contents, position, justification and color of text blocks, edit the appropriate parameter values in *params.mtl*. The examples in this section show parameters that affect text block 1.

> To specify the desired text, enter it within the quotation marks:

```
(setqb overlayTextStr1[0] "MÄK Technologies")
(setqb overlayTextStr1[1] "MÄK Stealth")
(setqb overlayTextStr1[2] "")
(setqb overlayTextStr1[3] "")
```

> To set the horizontal justification of text within the block, edit the **overlayTextHorJust1** parameter. Replace *n* with 0 for left justification, 1 for centered, or 2 for right justification.

```
(setqb overlayTextHorJust1 n)
```

> To set the vertical justification of text within the block, edit the **overlayTextVerJust1** parameter. Replace *n* with 0 for bottom justification, 1 for centered, or 2 for top justification.

```
(setqb overlayTextVerJust1 n)
```

> To set the position of the text block, edit:

```
(setqb overlayTextPos1[0] horiz-pos)
(setqb overlayTextPos1[1] vert-pos)
```

Replace *horiz-pos* with a value between -100 and 100, where -100 is the left edge of the graphics display, 0 is the center, and 100 is the right edge. Likewise, replace *vert-pos* with a value from -100 to 100 where -100 is the bottom of the window and 100 is the top. For example, the following settings position text block 1 at the top center of the graphics display:

```
(setqb overlayTextPos1[0] 0.0)
(setqb overlayTextPos1[1] 99.0)
```

The screen-location and justification settings are effective in Text mode only. In Status mode, block 1 is centered at the top of the screen, and block 2 is centered at the bottom.

> To modify the color and opacity of the text blocks, see "Modifying Overlay Colors" on page 6-6.

Modifying Overlay Colors

The following four parameters (in *params.mtl*) control the color and opacity of overlay elements:

overlayDfltCol	Default color. Sets the color and opacity of all overlay elements not determined by the parameters below.
overlayFadeColor	Sets the color and opacity of all Entity Locator parts except its outer ring and direction labels.
overlayTextColor1 **overlayTextColor2**	Sets the color and opacity of the text blocks.

Each of the parameters takes a hexadecimal number as a color argument. This number specifies values for opacity (alpha), blue, green, and red:

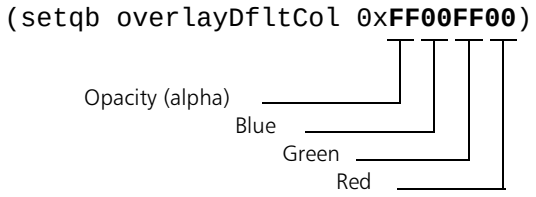


Figure 6-4. Specifying overlay color values

Each of the four color channels is set to a value between 00 and FF, with a higher value resulting in higher saturation (or opacity) for that channel. The list below contains some example color values:

Opaque White	`FFFFFFFF`
Opaque Red	`FF0000FF`
Opaque Blue	`FFFF0000`
Opaque Yellow	`FF00FFFF`
Opaque Green	`FF00FF00`
Transparent Green (50%)	`8000FF00`
Very Faint Green (10%)	`1900FF00`

6.2. Electromagnetic Sensor Volumes (SGI and DIS only)

Using information contained in Electromagnetic Emission PDUs, the SGI version of the Stealth can represent emission fields created by radars and other devices. These emissions appear as translucent volumes attached to the emitting entity, as shown in Figure 6-5.

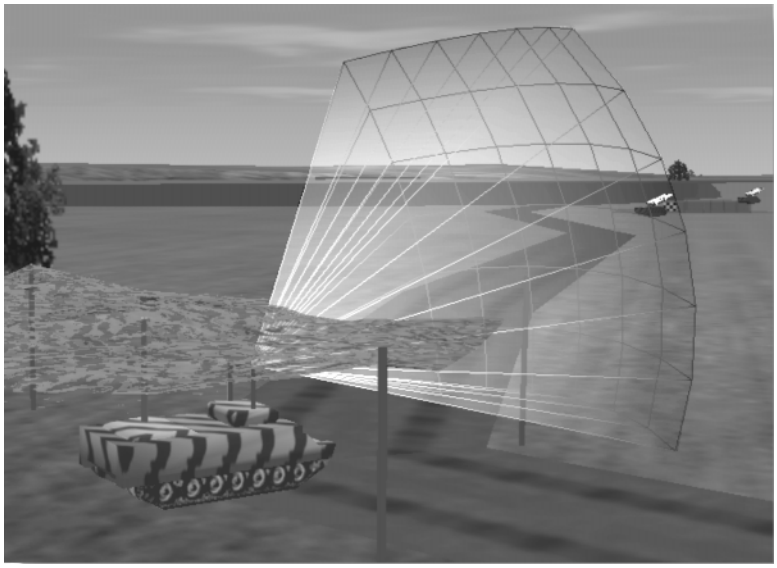


Figure 6-5. Electromagnetic Sensor Volume of a Radar

The sensor volume's orientation, field of view, and point of origin are determined by values in the EM-Emission PDU. Other characteristics, such as radius and color, are determined by a combination of Stealth variables and values in the EM-Emission PDU, as described in section 6.2.4, "Controlling Sensor Volume Radius" and section 6.2.5, "Using Sensor Volume Colors".

6.2.1. Displaying Electromagnetic Emissions Fields

To display electromagnetic emissions:

1. Open the Sensor Volumes dialog box (Figure 6-6).
2. On the EM Emissions drop-down list, choose Display.

> To toggle the display of electromagnetic emissions from the keyboard, press e.

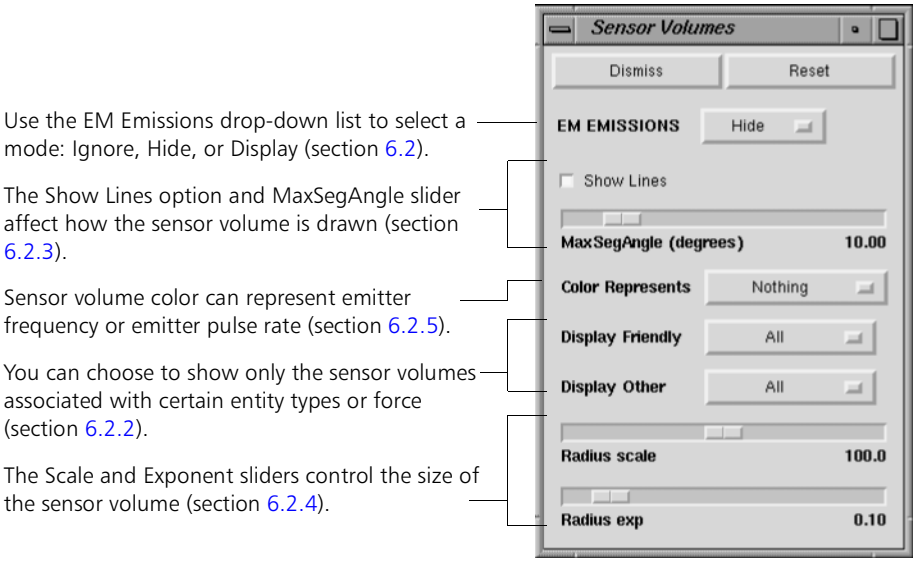


Figure 6-6. The Sensor Volumes dialog box

The options on the EM Emissions drop-down list are:

- Ignore: the Stealth disregards all electromagnetic emission PDUs.
- Hide: the Stealth processes emission PDUs, but does not display volumes.
- Display: the Stealth processes emission PDUs and displays sensor volumes.

Note: If you hide the display of emission PDUs, if you decide to display them, they are immediately available. If you ignore emission PDUs, if you decide to display them, you might not have anything to display, because emission PDUs are not necessarily sent out with every state update message.

Setting the Initial Sensor Volume Mode

> To choose a default sensor volume mode, edit the **stealthDisplayEmPdu** parameter in *params.mtl*.

```
(setqb stealthDisplayEmPdu n)
```

Set *n* to 0 for Ignore, 1 for Hide, or 2 for Display.

6.2.2. Displaying Sensor Volumes for a Subset of Entities

You can display sensor volumes for a subset of entities, based on the entities' Entity Type and Force ID.

> To display sensor volumes for a subset of entities, choose the entity type from the Display Friendly or Display Other drop-down lists on the Sensor Volumes dialog box (Figure 6-7).

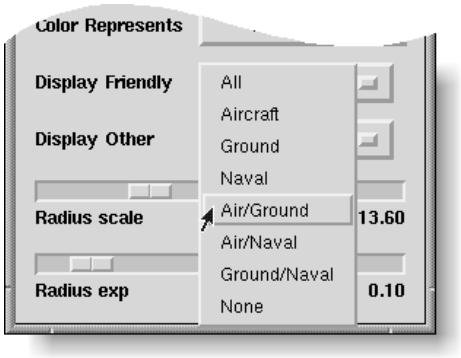


Figure 6-7. The Display Friendly drop-down list

The Display Friendly drop-down list affects entities with a Force ID of 1; the Display Other drop-down list affects entities with a Force ID other than 1.

6.2.3. Configuring Sensor Volume Segments

The Stealth displays a sensor volume as a group of spherical sections projecting from the sensing device. By default, for each 10 degrees (or portion thereof) in the sensor's field of view, the Stealth draws one segment. For example, a sensor with a 35° or 40° field of view is displayed as a group of four 10° pyramids (Figure 6-8).

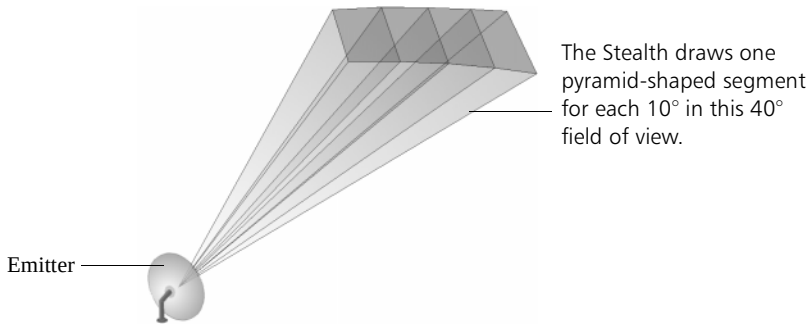


Figure 6-8. Sensor Volume as a Group of Polygons

Controlling Segment Arc Size

> To change the size of the arc represented by one segment, edit the **initMaxAngle** parameter in *params.mtl*:

```
(setqb MySensorVolume::initMaxAngle n)
```

Replace *n* with the desired segment size in degrees.

Displaying Segment Outlines

By default, the Stealth displays opaque outlines showing the segment edges along the surface of the sensor volume.

> To show or hide segment outlines, check or clear the Show Lines checkbox in the Sensor Volumes dialog box.

> To control whether these lines are on or off by default, edit the **initShowLines** parameter in *params.mtl*. Set *n* to 1 to show the lines, or 0 to hide them.

```
(setqb MySensorVolume::initShowLines n)
```

6.2.4. Controlling Sensor Volume Radius

A sensor volume's radius (that is, the distance it extends from the emitter) is based in part on Emitter Power and Field of View data obtained from EM Emission PDUs. A higher Emitter Power value results in a longer radius, while a wider Field of View results in a shorter radius (because the radiated power is distributed over a wider area).

If the Stealth relied exclusively on these values, the range of sizes among different sensor types could become too wide to be practical, with some emissions being barely visible, and other emissions covering the entire virtual world.

> To change the length of sensor volumes adjust the sliders for the radius exponent and radius scale factors at the bottom of the Sensor Volumes dialog box.

How the Stealth Calculates the Radius

The Stealth calculates sensor volume radius using the following formula:

$$\text{radius} = \text{scale factor} \times \left(\frac{\text{power}}{\text{area}}\right)^{\text{radius-exp}/2}$$

where power and area are defined within the PDU.

The radius scale is a factor, between 1 and 10,000, by which the all sensor volume radii are multiplied.

> To change the default radius scale (100) to a different value, edit the **initRadiusSF** parameter in *params.mtl*. Set *n* to the desired scale factor.

```
(setqb MySensorVolume::initRadiusSF n)
```

The radius exponent allows you to apply exponential changes to the sensor volume radii.

> To change the default radius exponent (0.100000) to a different value, edit the **initRadiusExp** parameter in *params.mtl*. Set *n* to the desired exponent.

```
(setqb MySensorVolume::initRadiusExp n)
```

6.2.5. Using Sensor Volume Colors

Sensor volume color can serve one of three purposes. It can:

- Represent emitter frequency.
- Represent the emitter pulse repetition frequency.
- Remain constant and represent nothing (the default behavior).

> To choose a color behavior, select an option from the Color Represents list in the Sensor Volumes dialog box.

> To specify the default color behavior, edit the **initColorIndicates** parameter in *params.mtl*.

```
(setqb MySensorVolume::initColorIndicates n)
```

where *n* equals 0 for *Frequency*, 1 for *Pulse Repetition Frequency*, or 2 for *Nothing*.

The following sections describe the color options in detail.

Using Sensor Volume Color to Represent Emitter Frequency

When sensor volume color represents frequency, color is determined by the frequency field of the EM Emission PDU, and a pair of frequency-range parameters.

If the emitter frequency is lower than your specified low frequency, the sensor volume is red. As frequency rises above the specified low frequency, sensor volume color changes, progressing through the colors of the visible spectrum until the specified high frequency is reached. At the high frequency and above, the sensor volume is violet.

The default low and high frequency values are 800MHz and 1GHz, respectively.

> To specify low and high emitter frequencies, edit the **loFreq** and **hiFreq** parameters in *params.mtl*. Enter the frequencies in Hz.

```
(setqb MySensorVolume::loFreq 800000000.0)
(setqb MySensorVolume::hiFreq 1000000000.0)
```

Using Sensor Volume Color to Represent Pulse Repetition Rate

Sensor volume color based on pulse rate works the same way as color based on emitter frequency, described above.

The default low and high pulse repetition frequencies are 100Hz and 3KHz.

> To specify low and high pulse repetition frequencies, edit the **loPRFreq** and **hiPRFreq** parameters, entering the desired frequency in Hz.

```
(setqb MySensorVolume::loPRFreq 100.0)
(setqb MySensorVolume::hiPRFreq 3000.0)
```

Setting Default Sensor Volume Colors

When sensor volume color represents nothing, the color at the volume origin (the emitter location) is determined by the parameter **dfltNColor** (for near color), set to white by default. The color at the volume's radius is determined by **dfltFColor** (for far color), magenta by default.

> To change the colors, edit **dfltNColor** and **dfltFColor** in *params.mtl*.

Set the arguments between 0.0 and 1.0, using 1.0 for full color saturation (or full opacity, for the alpha channel).

```
(setqb MySensorVolume::dfltFColor[0] 1.0)          Red
(setqb MySensorVolume::dfltFColor[1] 0.0)          Green
(setqb MySensorVolume::dfltFColor[2] 1.0)          Blue
(setqb MySensorVolume::dfltFColor[3] 0.500000)     Alpha

(setqb MySensorVolume::dfltNColor[0] 1.0)          Red
(setqb MySensorVolume::dfltNColor[1] 1.0)          Green
(setqb MySensorVolume::dfltNColor[2] 1.0)          Blue
(setqb MySensorVolume::dfltNColor[3] 0.500000)     Alpha
```

Figure 6-9. Parameters for Setting Default Sensor Volume Colors

6.2.6. Specifying Sensor Volume Lifetime

A sensor volume's lifetime is the time that it persists in the Stealth display after its last EM Emission PDU is received by the Stealth. By default, sensor volume lifetime is 100 seconds.

> To specify sensor volume lifetime, edit the **lifetime** parameter in *params.mtl*. Replace *n* with the desired number of seconds.

```
(setqb MySensorVolume::lifetime n)
```

6.3. Visual Options Common to Stealth for SGIs and PCs

This section describes the visual options common to Stealth for SGIs and PCs:

- Time-of-day and lighting effects
- Texture maps
- Fog placement
- Clipping
- Entity filtering.

Most options are controlled using the Visual Options dialog box. The PC version of this dialog box contains a subset of the controls in the SGI version (Figure 6-17).

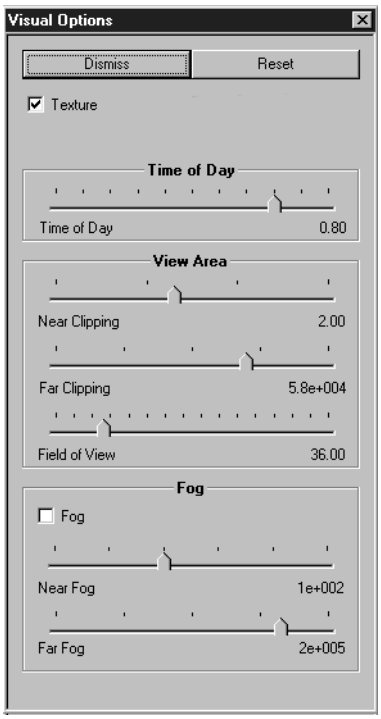


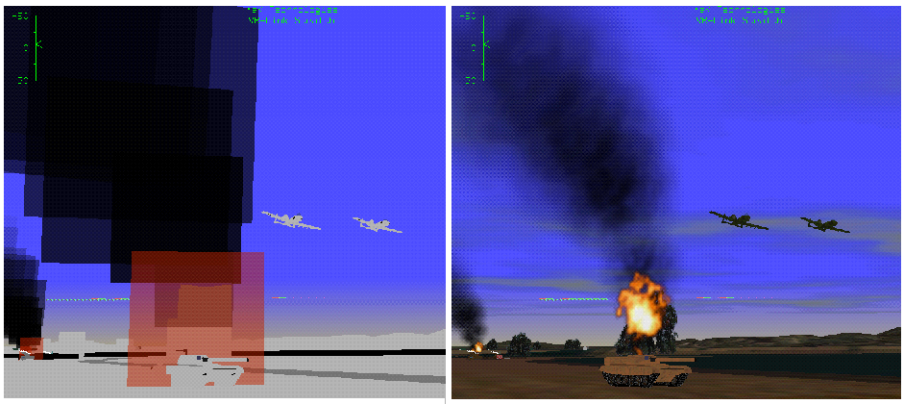
Figure 6-10. The Visual Options dialog box in Stealth for PCs

"Visual Options Available Only On Stealth for SGIs" on page 6-21, describes basic visual options available only in Stealth for SGIs. Chapter 10, *Advanced Options for SGIs* covers advanced options for Stealth for SGIs.

6.3.1. Controlling Display of Texture

You can control whether or not the Stealth displays models' associated texture maps. When Texture is turned off, models appear as assemblies of untextured polygons. Figure 6-11 illustrates a scene with texture turned on and off.

> To turn texture on or off, check or clear the Texture checkbox on the Visual Options dialog box. [Keyboard: t toggles Texture on and off]



Texture off Texture on

Figure 6-11. Texture

6.3.2. Setting the Time of Day

> To control how the Stealth displays time of day, adjust the Time of Day slider.

The slider controls the quality of the scene's ambient light. At its zero position, the scene is dark. On the SGI only, at low values, the sky takes on a reddish hue reminiscent of sunrise or sunset. Setting the slider's to its maximum position (1.0) creates a midday ambience.

Figure 6-12 illustrates different time of day settings.

> To change the default time of day, edit the **timeOfDay** parameter in *params.mtl*. Replace *n* with a value between 0 and 1.000000.

```
(setqb ViewState->timeOfDay n)
```

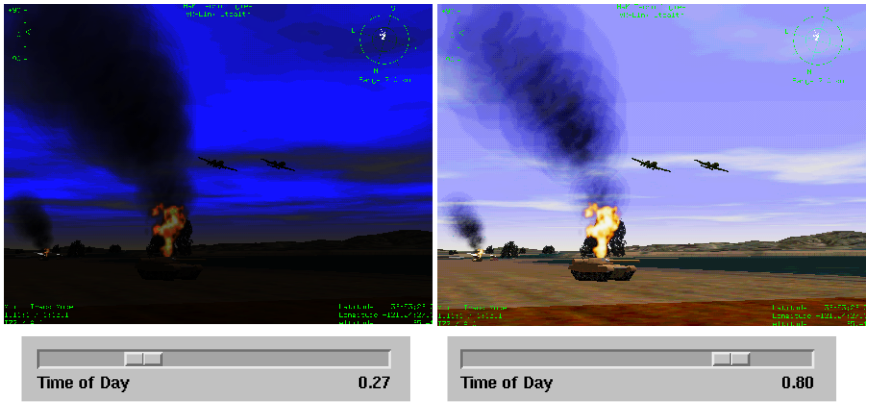


Figure 6-12. Time of Day

6.3.3. Controlling Clipping

To improve performance, the graphics engine doesn't process entities and terrain objects that fall outside of a specified distance range. This range is determined by the near and far clipping planes. Figure 6-13 illustrates the effect of changing the Near Clipping value. Figure 6-14 illustrates the effect of changing the Far Clipping value.

> To set the location of the clipping planes relative to the eyepoint, adjust the Near Clipping and Far Clipping sliders in the Visual Options dialog box. Clipping values are specified in meters.

> To set the Stealth's default clipping values, edit *params.mtl*. Replace the sample values with new distances, in meters.

```
(setqb ViewState->nearClip 2.0)
(setqb ViewState->farClip 20000.0)
```

Note: You can also set a filter range to prevent distant entities from being processed while allowing distant terrain to appear normally. See "Filtering Out Distant Entities" on page 6-20 for more information.

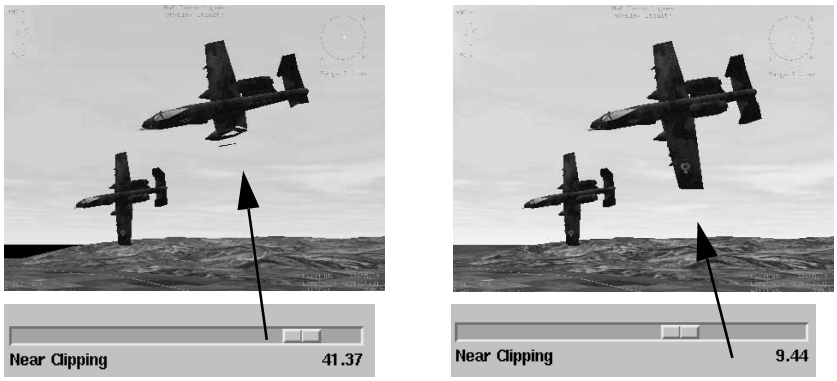


Figure 6-13. Near clipping

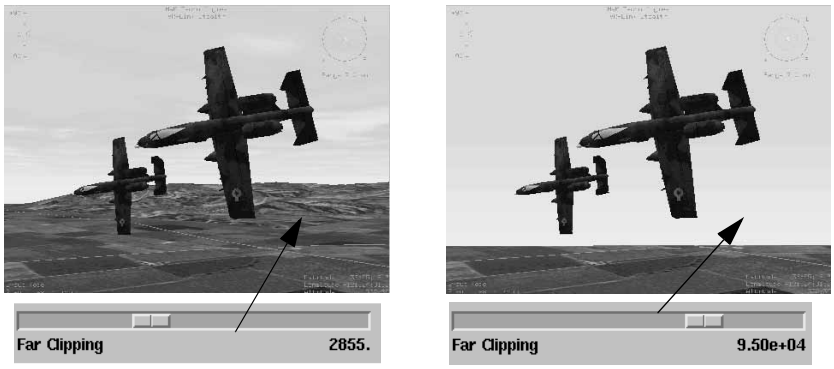


Figure 6-14. Far clipping

6.3.4. Setting the Eyepoint Field of View

The Field of View setting affects perspective in a manner similar to a camera lens. Figure 6-15 illustrates different field of view settings.

A wide field of view creates an effect like that of a wide-angle lens. Objects appear smaller and farther away from the eyepoint, since the eyepoint coverage spans a wider area. Depth distances between objects become exaggerated.

A narrow field of view creates an effect like that of a telephoto lens. Objects appear larger and closer to the eyepoint, and the overall scene depth appears flattened. The distances between objects appears compressed.

> To control the field of view, adjust the Field of View.

The slider sets the vertical Field of View to a value between 10° and 160°. The horizontal field of view depends on the graphics display's aspect ratio. For example, when the graphics display's aspect ratio is 4:5 (as in full-screen mode) and you are using the default 36° vertical Field of View setting, the resulting horizontal field of view is 45°.

> To specify a different default eyepoint field of view, edit the **initialFov** parameter in *params.mtl*. Replace *n* with the desired vertical field of view in degrees.

```
(setqb initialFov n)
```

> To set the field of view at startup, use the `-v angle` command-line option, where `angle` is the vertical field of view in degrees.

Field of view set to 94.17

Field of view set to 34.17

Figure 6-15. Field of view

6.3.5. Controlling Fog

The Stealth simulates fog effects by blending object colors with a predefined fog color.

> To turn fog on or off, check or clear the Fog checkbox.

> To specify where fog first becomes visible and where it becomes completely opaque, adjust the Near Fog and Far Fog sliders.

Figure 6-16 illustrates the effect of different settings of Far Fog

> To set the initial values of the Near Fog and Far Fog sliders, edit the **farFogRange** and **nearFogRange** parameters in *params.mtl*. Replace the sample values with the desired distances:

```
(setqb ViewState->farFogRange 200000.0)
(setqb ViewState->nearFogRange 100.0)
```

Note: On the SGI platform, you can choose the fog distribution pattern. The Stealth for PCs always uses a Lin fog distribution pattern. See section 6.4.4, "Specifying the Fog Type" for more information.

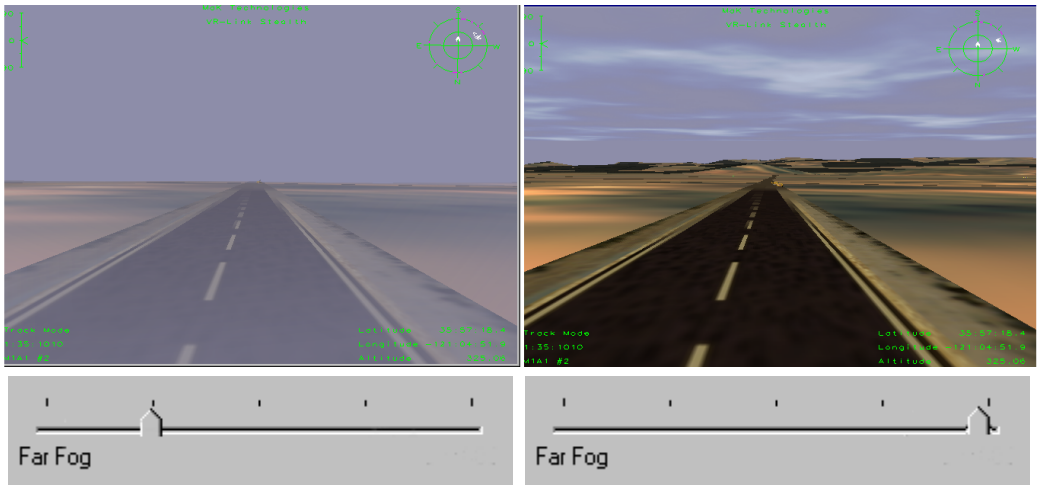


Figure 6-16. Fog

Note: The Stealth for SGIs prevents you from moving the Near Fog slider to a distance that is farther away than the Far Fog distance. On the Stealth for PCs, you can move the slider for Near Fog to a distance farther than Far Fog, but the Stealth sets the values to be equal.

6.3.6. Filtering Out Distant Entities

You can set a filter range to prevent distant entities from appearing. The result is similar to far clipping (described in section 6.3.3, "Controlling Clipping"), except that entity filtering affects only entities and has no effect on terrain, whereas clipping affects both.

> To control entity filtering, edit the **WeAreFiltering** and **FilterRange** parameters in *params.mtl*:

```
(setqb WeAreFiltering 0)
(setqb FilterRange 0.0)
```

To enable entity filtering, set **WeAreFiltering** to 1. Specify the **FilterRange** in meters.

Note: Entities that are filtered out are not listed on the entity list.

6.3.7. Setting Anti-Aliasing

Anti-aliasing is a method of smoothing the jagged appearance of object edges, especially those represented by curves or diagonal lines. Pixels that surround these edges are filled in with varying shades of gray or color in order to blend the sharp edge into the background, resulting in a more accurate display.

Setting Anti-Aliasing on SGI

On SGI machines that support anti-aliasing, you can set anti-aliasing in the Visual Options dialog box.

> To turn anti-aliasing on or off, check or clear the Anti-Alias checkbox in the Visual Options dialog box.

Setting Anti-Aliasing on PCs

On PCs with graphics boards based on the Voodoo chipset, you can set anti-aliasing in a configuration file.

> To set anti-aliasing in your configuration file, add the **gvsAntialiasing** parameter.

Set *n* to 1 to turn anti-aliasing on, 0 to set it off.

```
setqb gvsAntialiasing n
```

6.3.8. Restoring the Default Visual Options

> To restore the settings in the Visual Options dialog box to the default settings stored in *params.mtl*, click the Reset button.

6.4. Visual Options Available Only On Stealth for SGIs

The Stealth for SGIs has several basic visual options not available on PCs. The options described in this section are:

- Lighting
- Draw-style
- The earth/sky backdrop
- Fog distribution
- Anti-aliasing

Figure 6-17. The Visual Options dialog box on the SGI Platform

The right side of the Visual Options dialog box contains several advanced controls primarily for users familiar with IRIS Performer. These options, including stress, cull mode, and level of detail, are described in Chapter 10, *Advanced Options for SGIs*.

6.4.1. Controlling Use of Lighting

When Lighting is in effect, models appear shaded and take on a three-dimensional quality. When Lighting is turned off, models still appear textured (if textures are turned on), but do not appear shaded. Figure 6-18 illustrates an object with lighting off and lighting on. The distinctions are relatively subtle. Note the flatness of the surface of the tank with lighting off compared to the one with lighting on. The differences are easier to see if you view this page in the PDF version of this manual, which is in color and can be magnified.

> To toggle Lighting on or off, check or clear the Lighting checkbox. [Keyboard: l (lowercase L)]

Note: Models do not cast shadows on the terrain (or on other models), even when Lighting is turned on.

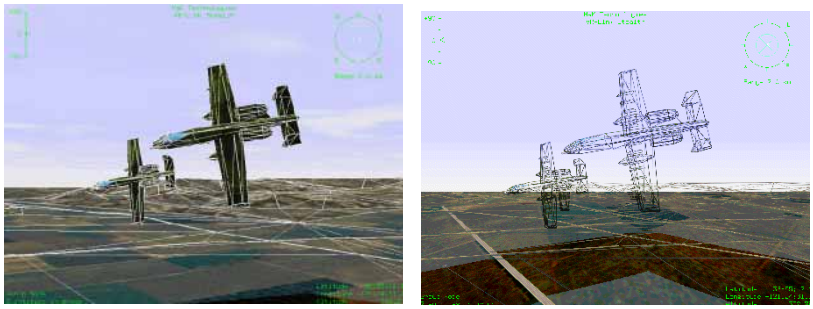
Lighting on | Lighting off

Figure 6-18. Lighting

6.4.2. Setting the Draw Style

The Draw Style drop-down list contains options that affect how the Stealth draws models in the graphics display. In addition to the commonly-used Filled and Lines (wireframe) options, you can choose from several other draw styles including points-only, dashed-lines, and scribed.

The “w” key toggles between filled and wireframe displays.



Scribed Lines

Figure 6-19. Examples of draw style

6.4.3. Specifying Earth and Sky Backdrops

The Earth/Sky setting controls how the Stealth clears the frame and renders sky and ground effects prior to displaying each image.

> To specify an Earth/Sky setting, choose a setting from the Earth/Sky drop-down list.

Table 6-2 describes the options.

Table 6-2: Sky and earth backdrops

Option	Effect
Sky/Clear	Draws a sky with a gradient horizon, and clears the area below the horizon to a preset clear color. When a terrain database is loaded, this backdrop is used by default.
Sky/Ground	Draws a sky with a gradient horizon, and a ground plane. The ground plane is useful when you need to hide holes in the terrain, or when no database is loaded. This backdrop is used by default when you do not load a terrain database.
Sky	Draws a sky with a gradient horizon, but does not clear the area below the horizon with each new frame. Screen artifacts may be visible if the eyepoint moves below the horizon line.
Clear	Clears the background to a preset clear color, with no sky or ground plane.
Tag	Performs a partial clearing and does not draw a sky or ground. Use this option to reduce processing overhead. This option is functional only on graphics systems that support multisampling.

You can find more information about these modes in the Performer documentation.

Setting the Initial Earth/Sky Mode

> To specify the initial Earth/Sky mode from the Stealth command line, use the `-E` *`mode`* option. Replace *`mode`* with one of the following arguments:

```
Argument      Mode
skyclear      Sky/Clear
skygrnd       Sky/Ground
sky           Sky
clear         Clear
tag           Tag Clear
```

The default Earth/Sky mode is determined by the **ViewState->earthSkyMode** parameter in *params.mtl*. With its default value of -1, the Earth/Sky mode is determined by whether a terrain database is loaded (as described above).

> To change the default value for Earth/Sky mode, set **ViewState–>earthSkyMode** to one of the following values:

Mode	Value
Sky/Clear	307
Sky/Ground	304
Sky	303
Clear	302
Tag Clear	301

Setting Sky, Ground, and Clear Colors

> To set the base colors of the sky and ground backdrops, edit the following parameters in *params.mtl* (shown here with sample values):

```
(setqb groundColor[0] 0.140000)          Red in ground
(setqb groundColor[1] 0.250000)          Green in ground
(setqb groundColor[2] 0.360000)          Blue in ground
(setqb skyColor[0] 0.4)                  Red in sky
(setqb skyColor[1] 0.5)                  Green in sky
(setqb skyColor[2] 1.0)                  Blue in sky
```

The clear color is determined by your current Earth/Sky mode. In Sky/Clear mode, the ground color is used as the clear color. In all other Earth/Sky modes, the sky color is used as the clear color.

Changing Color With Altitude

In the Clear mode, the clear color can become deeper with increasing altitude.

> To control the color as altitude increases, edit the **altitudeDependentClearColor** parameter in *params.mtl*. Replace *n* with 1 to enable, or 0 to disable.

```
(setqb altitudeDependentClearColor n)
(setqb low_alt 70000.0)
(setqb high_alt 38000000.0)
```

The **low_alt** parameter determines the altitude (in meters) at which clear color begins to be affected. The **high_alt** parameter is the point at which the clear color becomes completely black.

Setting the Horizon Height

The Stealth displays the horizon as a graduated band of color between the sky and the horizon line. It appears solid at the horizon line, and gradually blends into the sky bottom.

> To change the height of the horizon band, edit the **skyHorizonAngle** parameter in *params.mtl*. Replace *n* with a value in degrees.

```
(setqb ViewState->skyHorizonAngle n)
```

Because the horizon blends into the sky, the height of the horizon band may appear smaller than expected.

6.4.4. Specifying the Fog Type

In addition to the fog blend-range features described in section 6.3.5, "Controlling Fog", the SGI version lets you select a fog type, that is, the fog distribution pattern within the fog range. The Fog Type list (Figure 6-20) varies depending on the platform you are using.

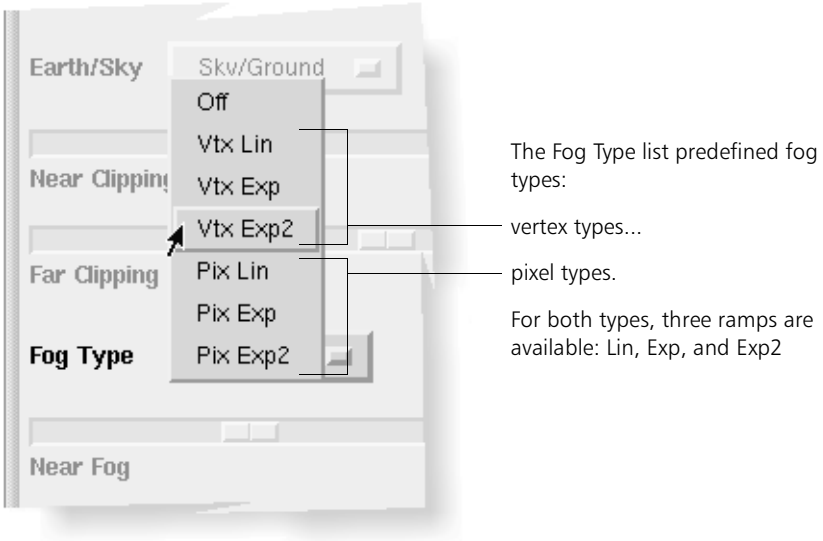


Figure 6-20. Fog Type list

Fog types are distinguished by a combination of two characteristics: a computation method and a ramp.

Computation Method

The computation method determines whether the blend of fog-color and object-color is calculated separately for each pixel of a given object. The Pix (Pixel) method causes the Stealth to perform a precise fog/object color-blend calculation for each pixel. The Vtx (Vertex) method causes the Stealth to compute the blend only at the vertices of object primitives, and to use interpolated values for the rest of the object. The Pix method renders fog more accurately, but consumes more processing power than the Vtx method.

Ramp

The ramp is a curve that represents the fog's distribution pattern within the blend range. The Stealth provides three ramps: Lin (Linear), Exp (Exponential), and Exp^2 (Squared Exponential). Figure 6-21 shows how fog opacity increases over distance with each of the three ramp types.

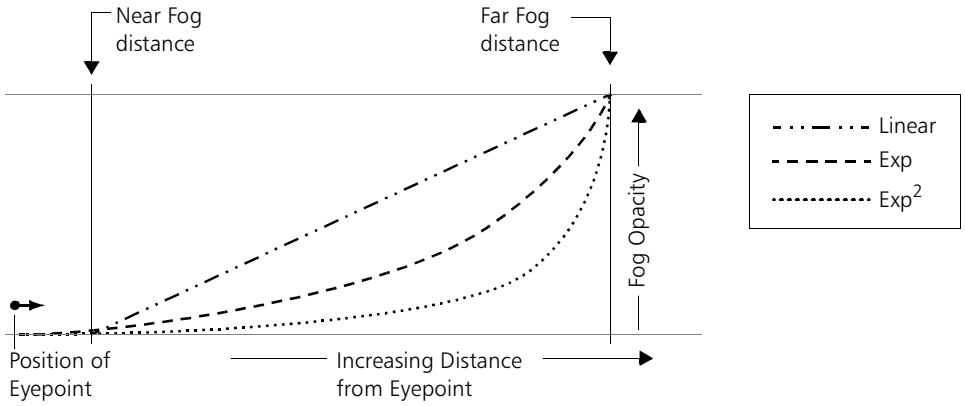


Figure 6-21. Comparison of Fog-Distribution Ramp Types

The Linear ramp causes a uniform increase in fog opacity over distance, with the onset of fog occurring at the Near Fog setting and full opacity occurring at Far Fog setting.

The Exponential ramp causes fog-opacity to increase gradually over distances near the eyepoint, and more rapidly for distances near to the Far Fog location. This ramp is a good choice for simulating heavy fog.

The Squared Exponential ramp causes fog-opacity to increase very gradually over nearby distances, then to increase sharply for distances near the Far Fog location. This ramp is the best choice for simulating a distant haze.

The Stealth takes the Near Fog setting into account only when the Linear ramp is in effect. When using the Exp and Exp^2 ramps, the fog onset begins at the eyepoint position. However, because the exponential ramps apply fog only very gradually at locations near the eyepoint, this difference should have little visible effect.

Setting the Default Fog Type

> To specify the default fog type, edit the **ViewState->fog** parameter in *params.mtl*:

```
(setqb ViewState->fog n)
```

Replace *n* with one of the following values:

```
0       Off
2       Vertex Exp
3       Vertex Lin
4       Pixel Exp
5       Pixel Lin
6       Vertex Exp2
7       Pixel Exp2
```

6.4.5. Capturing the Screen Image

> To capture the contents of the graphics display and save it in a file, click the Snap Screen button in the Visual Options dialog box. [Keyboard: I (while the graphics display is active)]

The resulting image file is stored in the IRIS RGB format, in the directory from which you executed the Stealth. The initial image file is named *Stealth.0.rgb*. If you capture more than one screen, the number in the file name is incremented.

The Stealth also saves a text file for each capture, named *Stealth.n.info*. This file stores the current near and far clipping distances, and the vertical and horizontal field of view settings.

6.4.6. Displaying Polygon Backfaces

The Stealth normally conserves system resources by processing only the front faces of polygons, and ignoring the back faces. This results in polygons appearing solid when viewed from the front side, but transparent when viewed from the back side. For example, when backface processing is disabled, the Stealth displays only the exterior sides of the polygons that make up a vehicle. When the eyepoint is outside the vehicle, it appears solid and complete. However, if the eyepoint is positioned inside the vehicle, the exterior walls become transparent.

> To toggle backface processing on and off, press the K key.

Note: On the PC, backface processing is always turned off.

> To set the Stealth's default backface mode, edit the **ViewState->backface** parameter in *params.mtl*. Replace *n* with 0 to turn backface processing on, or 1 (the default) to turn it off.

```
(setqb ViewState->backface n)
```

6.4.7. Reducing the Complexity of Special Effects

The Stealth displays special effects such as explosions using high-quality textured animations. These effects are usually desirable, but if you must minimize demands on system resources, you can simplify or disable them.

> To simplify or disable special effects, edit the **cheapEffects** or **useTexEffects** parameter in *params.mtl*:

```
(setqb cheapEffects 0)
(setqb useTexEffects 1)
```

Set the **cheapEffects** parameter to 0 to retain high-quality effects, or 1 to simplify the effects.

Set the **useTexEffects** parameter to 0 to eliminate high-quality effects entirely, or 1 to retain them.

6.5. Clouds

The Stealth can display a semi-transparent cloud pattern using any cloud model in the MultiGen *.flt* format. Clouds are tiled above the terrain as shown below.

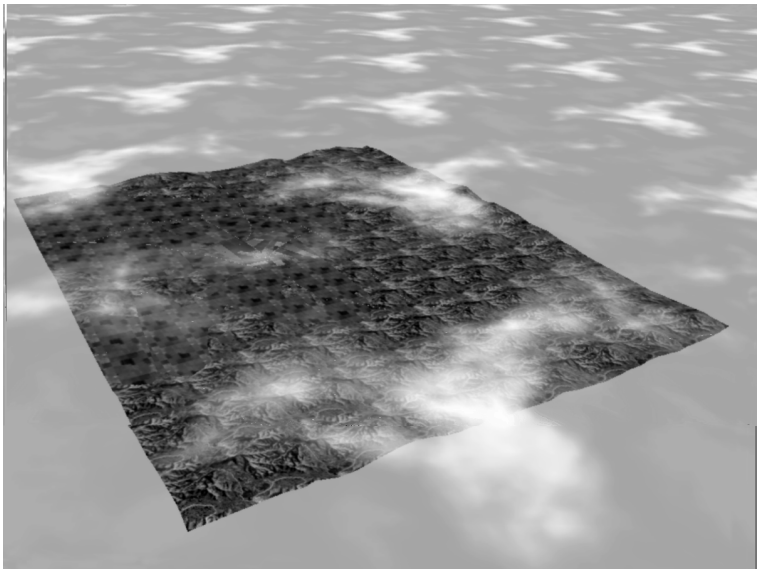


Figure 6-22. Cloud Tiling Pattern

Specifying a Cloud Model

> To specify a cloud model, edit the **cloudFile** and **cloudPath** parameters in *params.mtl* to provide the file name and location.

The cloud path is a space-delimited list of locations, separated by forward slashes, where the Stealth searches for the cloud file. Specify the locations as paths relative to the directory from which you run the Stealth, as in the example below.

Use a UNIX-style path and separate the directories by a colon:

```
(setqb cloudFile "cloud.flt")
(setqb cloudPath "./data/clouds:./data/hunter94")
```

Cloud Positioning

> To specify the altitude of the cloud plane, in meters, edit the **cloudHeight** parameter.

You can also set an X and Y offset distance between the origin of your terrain database and the cloud model's origin. Specify offset values in UTM coordinates, as in the samples below:

```
(setqb cloudHeight 3000.0)
(setqb cloudOffsetX 46320.328000)
(setqb cloudOffsetY -139036.141000)
```

6.6. Displaying Multiple Views (SGI only)

The Stealth can use Silicon Graphics' multichannel and multipipe features to display up to three views of a virtual world simultaneously. This makes it possible to set up a panoramic display that spans three monitors, or create a cockpit view with a front view and two side views.

To use multiple channels with the Stealth, you need graphics hardware that supports SGI's multichannel option (such as the Onyx MCO or Impact ICO), or a video system with multiple hardware Graphics Pipelines (such as the RealityEngine or Infinite Reality). Please see your SGI documentation for information on configuring and using these systems for multichannel operation.

Channels and Pipes

A channel is a particular view of a scene. A pipe is a software object that is involved in processing and displaying a view. On video systems with one hardware Graphics Pipeline, you typically use only one software pipe to process all channels. On machines with multiple Graphics Pipelines, you can gain a performance advantage by using a separate software pipe for each channel.

> To set the multipipe mode from the command line, use the `-Mn` option. Replace *n* with 0 to process all channels using a single pipe, or to 1 to use a separate pipe for each channel.

If you don't use the `-M` option, the Stealth's initial default argument (-1) causes the Stealth to set the multipipe mode automatically depending on how many hardware Graphics Pipelines are present. The -1 argument is equivalent to 0 on a machine with a single Graphics Pipeline, or 1 if more than one Graphics Pipeline is present. In general, you can use the default setting unless you want to force single-channel, single-pipe operation on a machine that has multiple Graphics Pipelines.

> To set the number of channels (or views) at Stealth startup, use the `-cn` command-line option. Replace *n* with the number of channels you want, up to 3.

If you don't use the `-c` option, the initial default argument (-1) causes the number of channels to be determined by the multipipe mode (described above). The number of channels is set to one if **Multipipe** is set to 0, or set to match the number of hardware Graphics Pipelines present if **Multipipe** is set to 1.

> To change the default multipipe and channel settings, edit the **NumChans** and **Multipipe** parameters, using the arguments discussed above:

```
(setqb NumChans -1)
(setqb Multipipe -1)
```

Note: The Stealth also supports IRIS Performer's Hyperpipe feature which lets you use two Graphics Pipelines to process a single channel, thereby gaining improved frame rates and detail levels. To enable Hyperpipe mode, start the Stealth with the `-M2` option. For more information, see the pfHyperpipe section of your Performer documentation.

Setting the Spacing Between Views

When displaying multiple views, you can specify a Field-of-View gap to reflect the physical arrangement of your monitors. For example, when three monitors are placed next to each other for a panoramic front view, the gap should be set to compensate for the width of the monitor bezels, perhaps 3-4°. When arranging monitors for two side-views and a front-view, a typical gap between monitors is 45°.

If you are using projected images, you may be able to place them adjacent to one another such that no gap is needed at all.

> To specify the Field-of-View Gap, start the Stealth with the `-v gap` option, where *gap* is the desired arc, in degrees.

> To set the default gap, edit the **fovGap** parameter in *params.mtl*:

```
(setqb fovGap 0.0)
```

Assigning Channels to Specific Monitors

If views appear on the wrong monitors, the Stealth provides two ways to reassign the channels.

> To assign specific pipes to channels, use the `-C pipelist` command-line option.

For example,

```
Stealth -C1,0,2
```

assigns the first channel to pipe 1, the second channel to pipe 0, and the third channel to pipe 2. You may need to experiment with the assignments to obtain the sequence you want.

> To reverse the sequence of channel-to-monitor assignments, set the **channelsRight-ToLeft** parameter to 1:

```
(setqb channelsRightToLeft 0)
```

6.7. Configuring the Display of Stealth for PCs

The Stealth for PCs lets you specify the following:

- Location of special effects bitmaps
- Screen resolution

6.7.1. Specifying the Location of Special Effects Bitmaps

> To specify a location of special effects bitmaps other than the default directory, use the **windowsDataPath** parameter in the *params.mtl* file.

```
setqb windowDataPath "directory"
```

The default location is the *./data* directory.

6.7.2. Specifying Screen Resolution

If your hardware supports multiple screen resolutions, you can specify a resolution for the Stealth in the configuration file. This feature affects the Stealth display generated by your 3D graphics card. It does not affect the normal Windows display.

> To specify the screen resolution, set the **fbf_resolution** parameter in the *params.mtl* file.

The syntax is:

```
setqb fbf_resolution "resolution"
```

where resolution can be any of the following that your hardware supports:

- 640 x 480
- 800 x 600
- 1024 x 768
- 1280 x 1024
- 1600 x 1200

Note: When you specify a resolution, do not use any spaces, for example:

```
setqb fbf_resolution "1024x768"
```

Note: The "x" must be lowercase.

Vehicle and Eyepoint Behavior

This chapter describes features that affect how entities and the eyepoint move with respect to the terrain. The Stealth can modify the apparent position of entities in order to compensate for uncorrelated terrain information or positional data received over the network from other applications.

This chapter also explains how to record and play back a script to control eyepoint movement.

Topics include:

- Ground Clamping, on page 7-2
- Absolute Dead Reckoning (DIS only), on page 7-4
- Trajectory Smoothing, on page 7-4
- Specifying Eyepoint Options in Absolute and Track Modes, on page 7-6
- Setting the View Floor, on page 7-7
- Setting the Initial Position of the Eyepoint, on page 7-9
- Remote Control of the Stealth, on page 7-11
- Using ModSAF to Control the Stealth (DIS only), on page 7-12

7.1. Ground Clamping

Because of differences in terrain databases among exercise participants, entities could sometimes appear to be underground, or hovering above the terrain surface when viewed on the Stealth. To compensate, the Stealth can clamp land and sea entities to the terrain surface. The Stealth keeps an entity anchored to the terrain surface regardless of the altitude data contained in its PDU.

Because ground clamping is computationally expensive, you can specify a range of interest. Entities that fall outside the range of interest are not ground clamped.

> To turn ground clamping on or off, select or clear the Clamp to Ground checkbox in the Stealth Options dialog box. [Keyboard: g toggles ground clamping on or off]

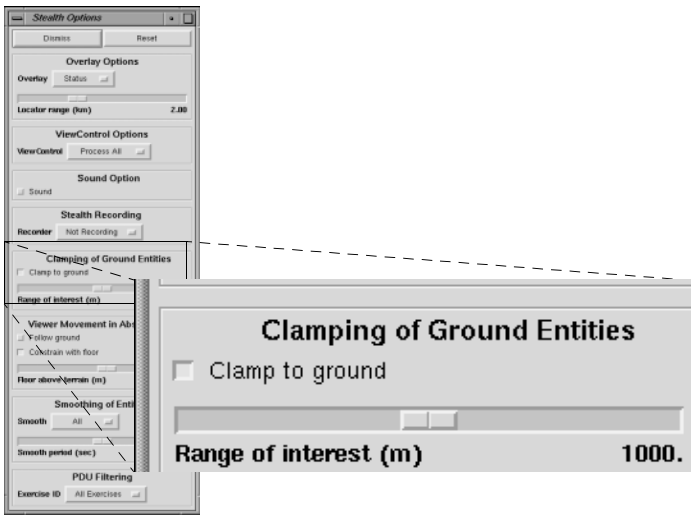


Figure 7-1. Controls for Ground Clamping.

> To change the range of interest, adjust the Range of Interest slider in the Stealth Options dialog box.

Setting Ground Clamping Defaults

> To change whether ground clamping is on or off at startup, edit the **permitGroundClamping** parameter in *params.mtl*. Set the argument to 1 to enable, or 0 to disable:

```
(setqb DtSgiReflectedEntity::permitGroundClamping 1)(SGI)
(setqb DtGvsReflectedEntity::permitGroundClamping 1)(PC)
```

> To set the default range of interest, edit the **clampThreshold2** parameter:

```
(setqb DtSgiReflectedEntity::clampThreshold2 1000000.0)
(SGI)
(setqb DtGvsReflectedEntity::clampThreshold2 1000000.0)(PC)
```

Note: The argument you enter should be the square of the desired range of interest. For example, the value above causes a default range of interest of 1000 meters.

Orientation Clamping

When ground clamping is in effect, the Stealth also performs orientation clamping by default. This feature adjusts the pitch and roll of an entity so that it appears properly seated when the terrain is inclined. For example, if a tank is moving horizontally across the face of a hill, orientation clamping prevents the tank from appearing level, and therefore, partially embedded into the hillside.

Note: You should disable orientation clamping when you are using geocentric coordinates, but are not loading a terrain database.

> To disable orientation, edit the **permitOrientClamping** parameter for your platform in *params.mtl*. Set the argument to 0 (disable), or 1 (enable):

```
(setqb DtSgiReflectedEntity::permitOrientClamping 1)(SGI)
(setqb DtGvsReflectedEntity::permitOrientClamping 1)(PC)
```

Ground Clamping of Explosions

By default, the Stealth applies ground clamping to terrain explosions.

> To turn ground clamping off or on, set the **DtClampTerrainHits** parameter in *params.mtl* to zero or one.

7.2. Absolute Dead Reckoning (DIS only)

In an exercise, participants' computer-clocks may be unsynchronized, leading to inconsistent timing information in state updates. To bypass this problem, the Stealth ignores the time stamp information contained in entity state updates and instead, bases dead reckoning calculations on update arrival times.

However, if participants' clocks are synchronized for absolute time stamping, you can improve dead reckoning accuracy by enabling **absolute dead reckoning**. This causes the Stealth to use the time stamps contained within state updates if the sender is using absolute time stamping.

> To configure absolute dead reckoning, edit the **timeStampType** parameter in *params.mtl*.

Set the argument to 0 to disable absolute dead reckoning (the default), or 1 to enable.

```
(setqb timeStampType 0)
```

7.3. Trajectory Smoothing

Even when using dead reckoning to forecast entity movements, discontinuities could be visible when an entity's position is updated upon the arrival of fresh data. The Stealth can eliminate these discontinuities by smoothing entities' trajectories and rotation paths.

> To set trajectory smoothing, select one of the following options from the Smooth drop-down list (Figure 7-2) in the Stealth Options dialog box:

- All entities (the default)
- All "viewed" entities
- The primary attached entity only
- No entities.

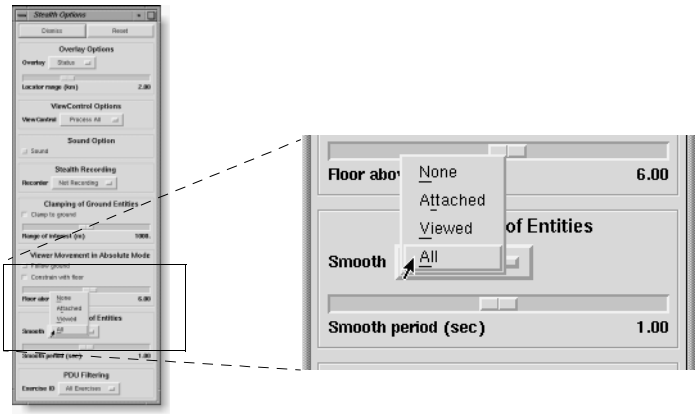


Figure 7-2. Controls for Smoothing

Note: "Viewed" refers to the primary and secondary attached entities, and all members of the view-group, not to other entities on the screen.

The smooth period is the period of time over which smoothing takes place, set to one second by default. If course corrections appear abrupt when forced to complete within one second, you may want to increase the smooth period.

Setting Smoothing Defaults

> To change the default smoothing settings, edit the **whoToSmooth** or **smoothPeriod** parameters in *params.mtl*:

```
(setqb StViewAttachable::whoToSmooth 3)
(setqb smoothPeriod 1.0)
```

Set the **whoToSmooth** argument as follows:

- None: 0
- Attached: 1
- Viewed: 2
- All: 3

Specify the **smoothPeriod** argument in seconds.

7.4. Specifying Eyepoint Options in Absolute and Track Modes

In the Absolute and Track view-modes, you can specify a minimum eyepoint height above the terrain (view floor), or force the eyepoint to maintain a constant height above the terrain surface (terrain following). Figure 7-3 illustrates the difference between these features. View floor ensures that the eyepoint is at least a certain height above the terrain, but doesn't care if it is higher. Terrain following ensures that the eyepoint stays at the same height above the terrain.

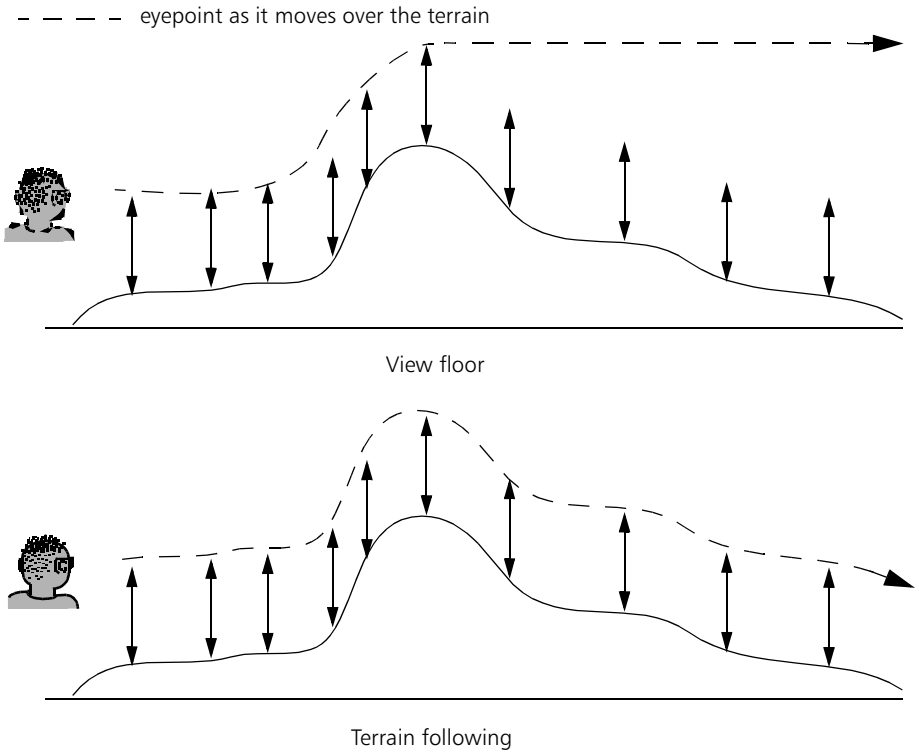


Figure 7-3. View floor versus terrain following

You control view floor and terrain following in the Viewer Movement pane in the Stealth Options dialog box (Figure 7-4.)

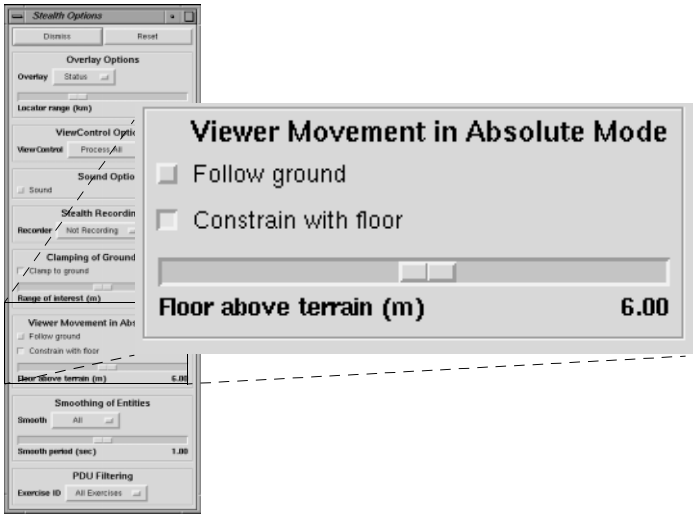


Figure 7-4. Controls for Eyepoint Movement in Absolute and Track Mode

7.4.1. Setting the View Floor

The view floor is a minimum height above the terrain in Absolute or Track mode, below which the eyepoint is not allowed to go. The view floor is measured relative to the terrain surface. While moving over hilly terrain, the eyepoint's height is automatically raised, if necessary, to keep it above the view floor.

This feature prevents the eyepoint from going underground and helps prevent the eyepoint from moving too close to terrain polygons. Otherwise, near-clipping could render these polygons invisible, resulting in a distracting visual anomaly.

> To enable or disable the view floor, check or clear the Constrain With Floor checkbox in the Stealth Options dialog box. [Keyboard: f toggles view floor on or off]

> To change the floor height above the terrain surface, adjust the Floor Above Terrain slider in the Stealth Options dialog box.

> To change the default view floor height (initially six meters), edit the **viewFloor** parameter in *params.mtl*:

```
(setqb viewFloor 6.0)
```

7.4.2. Enabling Terrain Following

Terrain following causes the eyepoint to maintain a constant distance above the terrain surface. The eyepoint's height changes in tandem with the peaks and valleys as it passes over the geography.

> To enable or disable terrain following, check or clear the Follow Ground checkbox in the Stealth Options dialog box (Figure 7-4). [Keyboard: d toggles terrain following on or off]

Terrain following causes a slight change in the way the altitude positional controls work. Instead of controlling eyepoint altitude in an absolute sense, these controls now control eyepoint height relative to the terrain surface.

Terrain following is available only in the Absolute and Track view-modes.

7.5. Setting the Initial Position of the Eyepoint

At Stealth startup, the eyepoint's initial position is determined by one of these factors:

- You can use the `-p` or `-G` command-line option to enter starting coordinates.
- If the `-p` or `-G` command line argument is not used, you can load a file that contains an eyepoint location saved during a previous session.
- The eyepoint appears at a default location if neither of the above methods is used. This location is different depending on whether a terrain database is loaded.

> To return the eyepoint to the initial position during run time, press the "o" key.

Setting Eyepoint Position from the Command Line

> To set the initial eyepoint position using geodetic coordinates, use the `-G` command-line option.

Follow `-G` with the desired latitude, longitude and altitude separated by commas. Specify latitude and longitude in decimal degrees and altitude in meters, for example,

```
Stealth -G lat(d),lon(d),alt(m)
Stealth -G 35:41:57.6,121:24:42.5,1250
```

> To specify starting coordinates in either UTM or geocentric coordinates, whichever system is used by your database, use the `-p` option.

Enter UTM coordinates in meters, for example,

```
Stealth -p easting,northing,up
Stealth -p 58753.00,50595.96,1250
```

Enter geocentric coordinates in meters, for example,

```
Stealth -p x,y,z
Stealth -p -2703155.25,-4426429.00,3701880.25
```

Note: When you use the `-p` argument, the Stealth treats the supplied coordinates as UTM or geocentric, depending on the **DtCigFrameKind** parameter. See "Using a Geocentric Database" on page 11-5 for more information.

Saving and Loading the Eyepoint Position

> At any time during a session, you can save the eyepoint's current position and orientation by pressing the "O" key.

The Stealth saves the position in a file named *startPosition.mtl*. In subsequent sessions, you can load this file from the command line using the `-l` argument as shown:

```
Stealth -l startPosition.mtl
```

You can also load this file by placing the following command in *Stealth.mtl*, or in another configuration file that is loaded at startup:

```
(load mtl-path "startPosition.mtl")
```

Default Initial Eyepoint Position

If you don't specify an initial eyepoint position, the eyepoint's default position depends on whether you are using a terrain database.

If you load a terrain database, the eyepoint appears at an altitude of 1250 meters, slightly to the south of the center of the database's bounding box. Because the eyepoint is oriented to face north, it is looking into the center of the database.

> To control the southerly offset and altitude when a database is used, edit the **viewStartLatSouthIfDb** and **viewStartAltIfDb** parameters.

The offset is specified in degrees of latitude. The altitude is given in meters.

```
(setqb viewStartLatSouthIfDb 0.045000)
(setqb viewStartAltIfDb 1250.0)
```

If you don't load a database, the eyepoint appears a position of zero easting and zero northing, at an altitude of 100 meters.

> To specify a different altitude to be used when no database is loaded, edit the **viewStartAltIfNdb** parameter:

```
(setqb viewStartAltIfNdb 100.0)
```

7.6. Configuring the Eyepoint Reset Position

Each Stealth view-mode has a **reset position** that lets you quickly position the eyepoint to a known location.

For many view-modes, the reset command positions the eyepoint directly south of, or behind, the attached entity, 25 meters from the entity's point of origin.

> To change the reset eyepoint distance, edit the **viewStdOffset** parameter in *params.mtl*. Specify the desired distance in meters:

```
(setqb viewStdOffset 25.0)
```

An additional parameter, **viewStdPitch**, controls the eyepoint's pitch upon reset. The default pitch (-5.0 degrees) sets the eyepoint to look slightly downward.

7.7. Remote Control of the Stealth

Remotely-generated view-control messages can select the Stealth's view mode and attached entity, and set the eyepoint's position and orientation. Most aspects of this feature are available only in DIS.

The following remote-control options are possible (all are DIS only):

- The Stealth can respond to view-control messages generated by ModSAF.
- You can use the *stealthCtrl* utility to issue individual view-control messages directly from an SGI command line. (SGI only)

Note: The Stealth's view-control PDUs are experimental, and are not an official part of DIS. They are of PDU kind 202.

7.7.1. Enabling the Processing of View-Control Messages

> To enable the processing of view-control messages, choose an option from the View Control drop-down list in the Stealth Options dialog box (Figure 7-5).

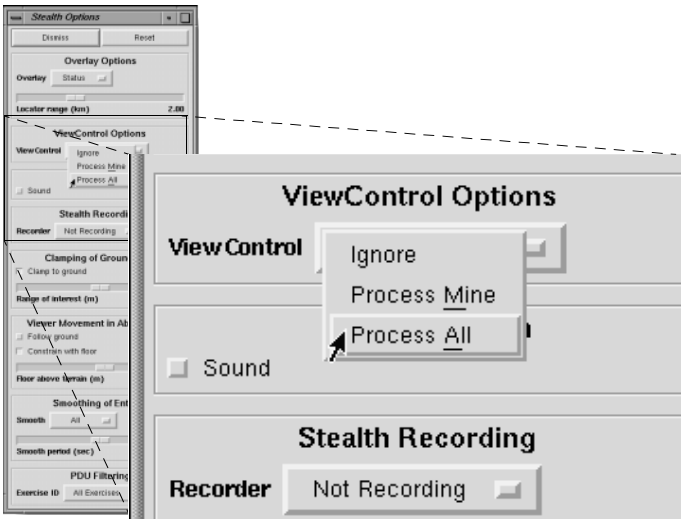


Figure 7-5. Controls for Recording and Processing View-Control Data.

By default, the Stealth processes all view-control messages.

> To disable processing of view-control messages, choose Ignore.

> To specify the default view control behavior, edit the **processViewControl** parameter in *params.mtl*.

Set the argument to 0 for Ignore, 1 for Process Mine, or 2 for Process All.

```
(setqb processViewControl 2)
```

DIS only

> To process view-control messages that are addressed specifically to your Stealth's entity ID, choose Process Mine.

7.7.2. Using ModSAF to Control the Stealth (DIS only)

You can control the Stealth through the ModSAF control interface. ModSAF communicates your actions through its ModStealth protocol, based on DIS Set Data and Data Query PDUs.

Note: This feature is not available with the DIS 2.0.3 version of the Stealth.

> To enable ModSAF control of the Stealth set the Stealth to send PDUs onto the network, as described in "Making the Stealth Visible to Other Applications" on page 8-7.

ModSAF must be using DIS 2.0.4. You can specify this with the `-version 4` command-line option.

The Stealth must be set to process view-control PDUs. This is enabled by default. See "Enabling the Processing of View-Control Messages" on page 7-11 for more information.

7.7.3. Using *stealthCtrl* (SGI and DIS only)

The *stealthCtrl* utility lets you send view-control messages from the command line. By combining several `stealthCtrl` commands in a shell script, you can create a view-control script from scratch.

A *`stealthCtrl`* command can switch the eyepoint into any view-mode, or can modify the current view-mode's parameters, including entity attachment, eyepoint position relative to the attached entity, or eyepoint orientation.

For most view-modes, the *`stealthCtrl`* command takes several arguments, described in the following sections. You can replace any argument with an "x" to leave the corresponding parameter unchanged. If you omit trailing arguments, the corresponding parameters remain unchanged.

stealthCtrl Syntax

This section lists the entire syntax for the `stealthCtrl` command. On the following pages, the command for each view mode is discussed individually.

```
stealthCtrl [-P port] [-A addr] [-v entID]
   absolute [-l|-c|-u] east north [altitude heading pitch
      roll]
   tether [site host entity eastOffset northOffset
      heightOffset heading pitch roll]
   compass [site host entity radius bodyHeading pitch
      headingOffset pitchOffset roll]
   mimic|turret [site host entity forward right up bodyHeading
      bodyPitch bodyRoll]
   orbit [site host entity radius azimuthRate heading pitch
      headingOffset pitchOffset roll]
   track [-l|-c|-u] east north [height site host entity]
   tetherTrack [attachSite attachHost attachEntity trackSite
      trackHost trackEntity forward right up]
   mimicTrack [attachSite attachHost attachEntity trackSite
      trackHost trackEntity forward right up]
   group [radialOffset heading pitch headingOffset
      pitchOffset]
   wideGroup [radialOffset pitch headingOffset pitchOffset]
   groupAdd s h e
   groupRemove s h e
   groupRemoveAll
```

Three optional arguments are available for all view-modes:

`-P` *`port`*	Specifies the UDP port. The default port is 3000.
`-A` *`address`*	Sets the default destination IP address for outgoing PDUs. Specify the address in the form of aaa.bbb.ccc.ddd.
`-v` *`s:h:e`*	When directing PDUs to a specific Stealth, specifies the entity ID (as site, host and entity) of the target Stealth.
`-h` *`command`*	Displays a usage synopsis for the specified command which may be any of the following:

absolute	groupRemoveAll	tetherTrack
compass	mimic	track
group	mimicTrack	turret
groupAdd	orbit	wideGroup
groupRemove	tether	

Note: MÄK's View-control PDUs are not part of DIS. If your exercise prohibits broadcast of non-DIS traffic, you can send stealthCtrl's PDUs only to the machine where the Stealth is running. Use the `-A` option, followed by the IP address of the Stealth machine.

Absolute Mode

`absolute [-l |-c |-u]` *`east north`* `[`*`altitude heading pitch roll`*`]`

`stealthCtrl absolute` causes the eyepoint to detach from any entity, and move to the specified coordinates (*`east`*, *`north`*, *`altitude`*) and orientation (*`heading`*, *`pitch`*, *`roll`*). The `-l`, `-c`, or `-u` option specifies whether the Stealth interprets your coordinates as geodetic (the default), geocentric, or UTM, respectively. For example:

```
stealthCtrl -u absolute 66000 55000 x 120 10 0
```

moves the eyepoint to the location 66000, 55000, x in UTM coordinates, where `x` is the current eyepoint altitude. Eyepoint orientation will be set to 120, 10, 0.

Tether Mode

```
tether [site host entity eastOffset northOffset
heightOffset heading pitch roll]
```

`stealthCtrl tether` attaches the eyepoint to the entity whose ID is *`site:host:entity`*.

> To set the eyepoint's position relative to the attached entity (in topographic coordinates), use the *`eastOffset`*, *`northOffset`*, and *`heightOffset`* parameters. Set the eyepoint's absolute orientation with *`heading`*, *`pitch`*, and *`roll`*.

For example:

```
stealthCtrl tether 1 2 1 x x x 130 5 0
```

attaches the eyepoint to entity 1:2:1, and keeps current values for *`eastOffset`*, *`northOffset`*, and *`heightOffset`* with respect to the entity. Absolute orientation is set to 130, 5, 0.

Compass Mode

```
compass [site host entity radius bodyHeading pitch
headingOffset pitchOffset roll]
```

`stealthCtrl compass` attaches the eyepoint to the entity whose ID is *`site:host:entity`*.

> To set the eyepoint position relative to the body frame of the attached entity (in polar coordinates), use the *`radius`*, *`bodyHeading`*, and *`pitch`* parameters.

> To modify eyepoint orientation, use *`headingOffset`*, *`pitchOffset`*, and *`roll`*.

Mimic and Turret Mode

```
mimic|turret [site host entity forward right up bodyHeading
bodyPitch bodyRoll]
```

`stealthCtrl mimic` attaches the eyepoint to the entity whose ID is *`site:host:entity`*.

> To set the eyepoint position (relative to the body frame of the attached entity), use the *`forward`*, *`right`*, and *`up`* parameters.

> To set the eyepoint orientation (also relative to the body frame of the attached entity), use *`bodyHeading`*, *`bodyPitch`*, and *`bodyRoll`*.

A `turret` command has the same parameters as mimic mode. The only difference is that Stealth enters turret mode.

Orbit Mode

`orbit [`*`site host entity radius azimuthRate heading pitch headingOffset pitchOffset roll`*`]`

`stealthCtrl orbit` attaches the eyepoint to the entity whose ID is *`site:host:entity`*.

> To set the eyepoint position (in polar coordinates, relative to the body frame of the attached entity), use the *`radius`*, *`heading`*, and *`pitch`* parameters.

The eyepoint orbits the attached entity at the rate you specify with *`azimuthRate`*.

> To apply offsets to the eyepoint's orientation, use *`headingOffset`*, *`pitchOffset`*, and *`roll`*.

Track Mode

`[-l|-c|-u] track` *`east north`* `[`*`height site host entity`*`]`

`stealthCtrl track` moves the eyepoint to the specified coordinates *`east`*, *`north`*, *`height`*, and cause it to track the entity whose ID is *`site:host:entity`*. The absolute orientation of the Stealth is slaved to the tracked entity's position in order to keep the entity centered in the field of view. The `-l`, `-c` or `-u` option specifies whether the Stealth interprets your coordinates as geodetic (the default), geocentric, or UTM, respectively.

Tether-Track Mode

`tetherTrack [`*`attachSite attachHost attachEntity trackSite trackHost trackEntity forward right up`*`]`

`stealthCtrl tetherTrack` gives the eyepoint a primary attachment to the entity whose ID is *`attachSite:attachHost:attachEntity`*, and a secondary attachment to the entity whose ID is *`trackSite:trackHost:trackEntity`*.

> Set the eyepoint position with the *`forward`*, *`right`*, and *`up`* parameters.

With respect to a ray passing through the primary and secondary entities, the *`forward`* parameter slides the eyepoint forward or back along the ray, while the *`right`* and *`up`* parameters specify lateral and vertical offsets relative to the ray.

The eyepoint orientation is slaved to the secondary entity's position such that this entity is kept centered in the field of view.

Mimic-Track Mode

`mimicTrack [`*`attachSite attachHost attachEntity trackSite trackHost trackEntity forward right up`*`]`

`stealthCtrl mimicTrack` gives the eyepoint a primary attachment to the entity whose ID is *`attachSite:attachHost:attachEntity`*, and a secondary attachment to the entity whose ID is *`trackSite:trackHost:trackEntity`*.

> To set the eyepoint position (relative to the body frame of the primary attached entity), use the *`forward`*, *`right`* and *`up`* parameters.

The eyepoint orientation is slaved to the secondary entity's position such that this entity is always centered in the field of view.

Group and Wide-Group Mode

```
group [radialOffset heading pitch headingOffset
pitchOffset]
wideGroup [radialOffset pitch headingOffset pitchOffset]
```

`stealthCtrl group` positions the eyepoint to keep all entities in the current view-group in the field of view. The base eyepoint position is determined by your specified *`heading`* and *`pitch`*. Modify the base position with the *`radialOffset`*, *`headingOffset`* and *`pitchOffset`* parameters.

`stealthCtrl wideGroup` puts the eyepoint broadside of the current view-group so that entities in the group appear distributed as widely as possible across the field of view. This command does not have a heading parameter, since the eyepoint heading is determined by the boundaries of the view-group. Otherwise, this command uses the same parameters as the group command.

Group Maintenance Syntax

```
groupAdd s h e
groupRemove s h e
groupRemoveAll
```

`stealthCtrl groupAdd` adds to the view-group the entity whose site, host and entity IDs are *`s:h:e`*.

`stealthCtrl groupRemove` removes from the view-group the entity whose site, host and entity IDs are *`s:h:e`*.

`stealthCtrl groupRemoveAll` removes all entities from the view-group.

Communications

This chapter describes options that affect how and what the Stealth communicates over the network. These options include network address settings, HLA and DIS-specific parameters, and options related to making the Stealth visible on the network:

- DIS Parameters, on page 8-2
- HLA Parameters, on page 8-5
- Protocol Independent Parameters, on page 8-6
- Communicating Information About the Stealth, on page 8-7

8.1. DIS Parameters

This section describes how to set parameters for DIS exercises.

8.1.1. Selecting the UDP Port

By default, the Stealth receives and sends data over UDP port 3000.

> To specify a different port, use the `-P` option followed by the desired port number, for example,

```
Stealth -P 2727
```

> To change the default UDP port, edit the **disPort** parameter in *params.mtl*, replacing the default with your desired port:

```
(setqb disPort 3002)
```

8.1.2. Subscribing to Multicast Groups

The Stealth can subscribe to one or more multicast groups.

> To monitor traffic on a multicast address, use the `-S` *`address`* option.

> To subscribe to multiple groups, use the `-S` *`address`* option several times on the command line, as follows:

```
Stealth -S 225.0.0.118 -S 225.0.0.202
```

Note: Multicast subscription is a property of the host machine, not of individual applications. If several applications are running on the same machine using the same port, and some of those applications subscribe to multicast groups, all the applications will receive packets for all multicast groups to which any application is subscribed.

Therefore, if the Stealth is running on the same machine and using the same port as other applications that subscribe to multicast groups, the Stealth may receive traffic intended for the other applications.

8.1.3. Setting the Target Address for Outgoing PDUs

The Stealth can send PDUs onto the network to communicate its position and orientation ("Communicating Information About the Stealth" on page 8-7). By default, these PDUs are sent to the host machine's broadcast address. Instead, you may want to direct the Stealth data to a unicast address so it is received by only one plan-view display or other single application.

> To specify the target address, use the `-A` command-line option followed by the address, for example,

```
Stealth -A 123.234.123.234
```

> To set the default address for outgoing PDUs, edit the **addressString** parameter in *params.mtl*.

Enter the address between the quotation marks, or leave a pair of empty quotation marks to use the broadcast address:

```
(setqb addressString "123.234.123.234")
(setqb addressString "")
```

8.1.4. Setting the Stealth's Entity ID

The Stealth's entity ID serves two purposes. It identifies the Stealth when it is sending PDUs onto the network, and it allows you to target your particular Stealth as the destination when using *stealthScript* or *stealthCtrl* to send view-control PDUs.

The initial entity ID is 140:1:1.

> To change the ID, edit the **stealthSite**, **stealthHost**, and **stealthEntity** parameters in *params.mtl*:

```
(setqb stealthSite 140)
(setqb stealthHost 1)
(setqb stealthEntity 1)
```

Customizing the Interface

This chapter explains how to modify controls and displays in the Stealth user interface. Topics include:

- Controlling Frequency of Display Updates, on page 9-2
- Specifying Units of Measurement, on page 9-3
- Adjusting the Sensitivity of Arrow Controls, on page 9-4
- Splash Screen (SGI only), on page 9-7
- Initial Graphics Display Window Settings (SGI only), on page 9-7
- Exit Confirmation (SGI only), on page 9-8
- Entity and View-Group Lists, on page 9-10
- Editing the Exercise ID Menu (DIS only), on page 9-11
- Displaying Stealth Controls on A Separate Terminal (SGI only), on page 9-12

9.1. The GUI Options Dialog Box

The GUI Options dialog box (Figure 9-1) gives you quick access to commonly-used interface adjustments. Use it to:

- Set how often readout fields in dialog boxes are updated
- Select units of measurement
- Adjust the sensitivity of dialog box's positional controls:

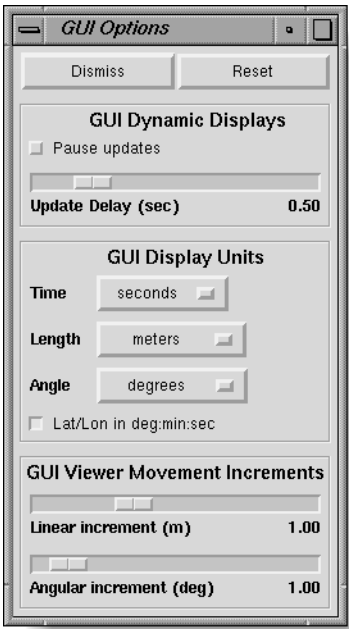


Figure 9-1. The GUI Options dialog box

9.1.1. Controlling Frequency of Display Updates

The Stealth Control, Entities in Exercise, and Info on Attached Entity dialog boxes contain dynamic fields that display position, orientation, and other information about the eyepoint and attached entities. By default, these fields are updated every half second.

> To change the frequency of updates, adjust the Update Delay slider in the GUI Options dialog box.

You can change the update rate to any value from .01 through 3 seconds.

> To freeze the fields at their current values, select the Pause Updates checkbox.

> To change the default update rate, edit the **sgMinUpdatePeriod** parameter in *params.mtl*. Replace the argument with the desired update rate, in seconds:

```
(setqb sgMinUpdatePeriod 0.500000)
```

9.1.2. Specifying Units of Measurement

In the GUI Options dialog box, you can specify units of measurement used in dynamic fields in the Stealth Control, Entities in Exercise, and Info on Attached Entity dialog boxes.

Time, Length and Angle Values

> To choose the units of measurement that appear in the dynamic displays, use the Time, Length, and Angle drop-down lists in the GUI Options dialog box.

Table 9-1 lists the units you can choose from each of the three lists. The initial defaults appear in boldface. The number following each option can be used to set that option as the default, as described below.

Table 9-1: Units of Measurement in Displays

Time Menu		Length Menu		Angle Menu	
Seconds	**0**	**Meters**	**0**	Radians	0
Minutes	1	Feet	1	**Degrees**	**1**
Hours	2	Kilometers	2	Revolutions	2
		Nautical Miles	3		

> To specify different defaults, edit the **sgTimeMenuInit**, **sgLengthMenuInit**, and **sgAngleMenuInit** parameters in *params.mtl*.

Replace the original argument with the appropriate number from the table.

```
(setqb sgTimeMenuInit 0)
(setqb sgLengthMenuInit 0)
(setqb sgAngleMenuInit 1)
```

Displaying Latitude and Longitude Values

> To control how latitude and longitude values are displayed, select or clear the Lat/Lon in deg:min:sec check box.

Latitude and longitude can appear in a degree:minute:second format, or in decimal degrees, as in these samples:

```
35:54:28.2     -121:20:15.7        degrees : minutes : seconds
35.907833      -121.337699         decimal degrees
```

> To set the default format, edit the **SgDynLatLon::dmsDisplay** (SGI) or **SgDmsDisplay** (PC) parameter in *params.mtl*.

Set the argument to 0 for decimal degrees, or to 1 for degrees:minutes:seconds.

```
(setqb SgDynLatLon::dmsDisplay 1)      (SGI)
(setqb SgDmsDisplay 1)                 (PC)
```

9.1.3. Adjusting the Sensitivity of Arrow Controls

> To adjust the sensitivity of the positional and rotational controls in the Stealth Control dialog box, adjust the Linear Increment and Angular Increment sliders in the GUI Options dialog box (Figure 9-2.)

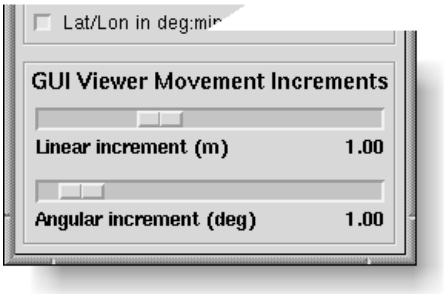


Figure 9-2. Viewer movement increments

The Linear Increment slider can set positional-control sensitivity between 0.01 and 10,000 meters of eyepoint movement per mouse-click. The Angular Increment slider can set rotational-control sensitivity between 0 and 15 degrees of eyepoint turn per mouse-click.

Note: Changing the sensitivity of the graphical position and orientation controls does not affect the sensitivity of keypad controls. To change the sensitivity of the keypad controls, see "Adjusting Control Sensitivity" on page 4-5.

How the View-Mode Affects Sensitivity Control Behavior

The sensitivity sliders affect the controls differently depending on the view mode. Table 9-2 describes the relationship of view mode and control behavior.

Table 9-2: View-Mode and sensitivity control behavior

View-mode	Angular Increment affects:	Linear Increment affects:
Spherical (Compass or Orbit)	Pitch and Yaw arrows. Left and right arrows. Up and down arrows.	Forward and backward arrows
Non-spherical	Pitch and Yaw arrows	Left and right arrows. Up and down arrows. Forward and backward arrows.

Control Sensitivity Defaults

Initially, the Linear Increment and Angular Increment sliders default to 1 meter and 1 degree respectively.

> To change linear and angular increment defaults, edit the **sgTranGain** and **sgRotGain** parameters in *params.mtl*.

`(setqb sgTranGain 1.0)` (default linear increment, in meters)
`(setqb sgRotGain 0.017453)` (default angular increment, in radians)

9.2. Adjusting Spaceball Sensitivity (SGI only)

> To control Spaceball sensitivity, edit the **sballRotGain**, **sballSphericalGain**, and **sballTranGain**, parameters in *params.mtl*, shown here with their default values:

```
(setqb sballRotGain 0.0000000174)
(setqb sballSphericalGain 0.00000000174)
(setqb sballTranGain 0.0000007)
```

The values for these parameters are a scaling factor for Spaceball settings. Experiment with the values until you get the sensitivity you want.

As with the arrow controls, Spaceball control sensitivity works differently depending on the view mode. Table 9-3

Table 9-3: View-Mode and Spaceball sensitivity control

View-mode	sballTranGain affects:	sballRotGain affects:	sballSphericalGain affects:
Spherical (Compass or Orbit)	Forward and backward motion	Pitch and yaw.	Left and right motion. Up and down motion
Non-spherical	Forward and backward motion. Left and right motion. Up and down motion.	Pitch and Yaw.	

9.3. Startup and Exit Options

The following sections explain how to configure how windows and dialog boxes are displayed when you start the Stealth.

9.3.1. Initial Graphics Display Window Settings (SGI only)

Window Size

> To specify the initial size of the graphics display on the SGI, start the Stealth with the `-W` command-line option:

```
Stealth -W width,height
```

Replace the variables with the desired window dimensions, in pixels. You can enter a single dimension if you want a square window.

> To set the default window size, edit the **WinSizeX** and **WinSizeY** parameters in *params.mtl*:

```
(setqb WinSizeX width)
(setqb WinSizeY height)
```

Replace the variables with the window dimensions you want, in pixels. If either argument is set to `-1` (the initial default) the graphics display opens in full-screen mode. The settings you enter here can always be overridden by the `-W` command-line option.

Window Position

> To set the initial location of the graphics display's lower-left corner on the SGI, edit the **WinOriginX** and **WinOriginY** parameters in *params.mtl*.

```
(setqb WinOriginX 270)
(setqb WinOriginY 0)
```

WinOriginX sets the distance, in pixels, between the left edge of the graphics display and the left edge of the screen. **WinOriginY** sets the distance between the bottom of graphics display and the bottom of the screen. These parameters have no effect in full-screen mode.

9.3.2. Splash Screen (SGI only)

> To have the Stealth display a bitmap image at startup, edit the **splashFile** parameter in *params.mtl*:

```
(setqb splashFile "path/filename.rgb")
```

Enter the your bitmap's path and file name within the quotation marks. The image file must be in the Iris RGB format.

9.3.3. Exit Confirmation (SGI only)

Upon exit, the SGI version of the Stealth runs a program called *xconfirm*, which displays an exit confirmation dialog box defined by parameters in *params.mtl*. The numbered parameters in the following examples correspond to the numbered controls in the illustration of the Exit Confirmation dialog box (Figure 9-3). By editing these parameters, you can customize the appearance of the dialog box.

①	`exitConfirmCmd "xconfirm"`	
②	`exitConfirmOpts "-icon question`	Sets the icon type.
	`-geometry 300x100+500+400"`	Sets box size and position.
③	`exitConfirmText "Exit the Stealth?"`	Sets text within the box.
④	`exitConfirmTitle "Exit Confirmation"`	Sets title-bar text.
⑤	`exitConfirmDfltYes 1`	Gives focus to Yes button.
⑥	`exitConfirmYes "Yes"`	Sets Yes button text.
⑦	`exitConfirmNo "No"`	Sets No button text.

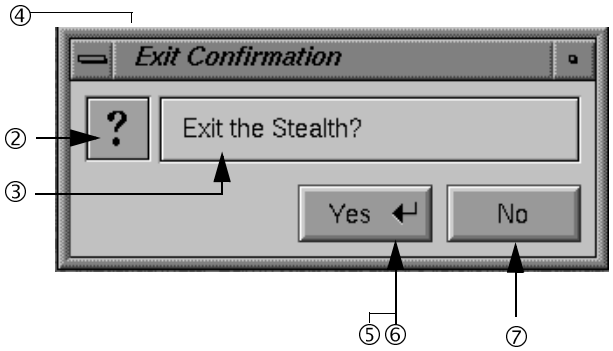


Figure 9-3. Exit Confirmation dialog box

If you find that the Stealth always exits without confirmation, the *xconfirm* program may not be in your path. To remedy this, place *xconfirm* in your path, or edit the **exitConfirmCmd** parameter so that its argument includes the appropriate path.

> To suppress exit confirmation, start the Stealth with the `-X` option, or delete the program name from the **exitConfirmCmd** parameter.

9.3.4. Specifying Which Dialog Boxes Appear at Startup

> To set which dialog boxes are opened at Stealth startup, edit the **sgInitialOpenWins** parameter in *params.mtl*:

```
(setqb sgInitialOpenWins n)
```

SGI

In the Stealth for SGIs, set **sgInitialOpenWins** to one of these values:

`-1`	Open the graphics display and all dialog boxes.
`0`	Open the graphics display only.
`1`	Open the graphics display and the main control window only.

PC

When you start the Stealth for PCs, the main control window opens by default. You can open a dialog box at startup by setting the **sgInitialOpenWins** argument to one of the following values:

`2`	Stealth Control dialog box
`4`	Stealth Options dialog box
`8`	Visual Options dialog box
`16`	Attached Entity Information dialog box
`32`	List of Entities dialog box
`64`	GUI Options dialog box

> To open multiple dialog boxes at startup, sum the values for the desired dialog boxes from the list above, and use that sum as the **sgInitialOpenWins** argument.

9.4. Entity and View-Group Lists

The Entities in Exercise dialog box contains two entity lists: one shows entities in the exercise; the other shows entities in the current view-group. For convenience, you can increase or decrease the number of entities displayed in these lists.

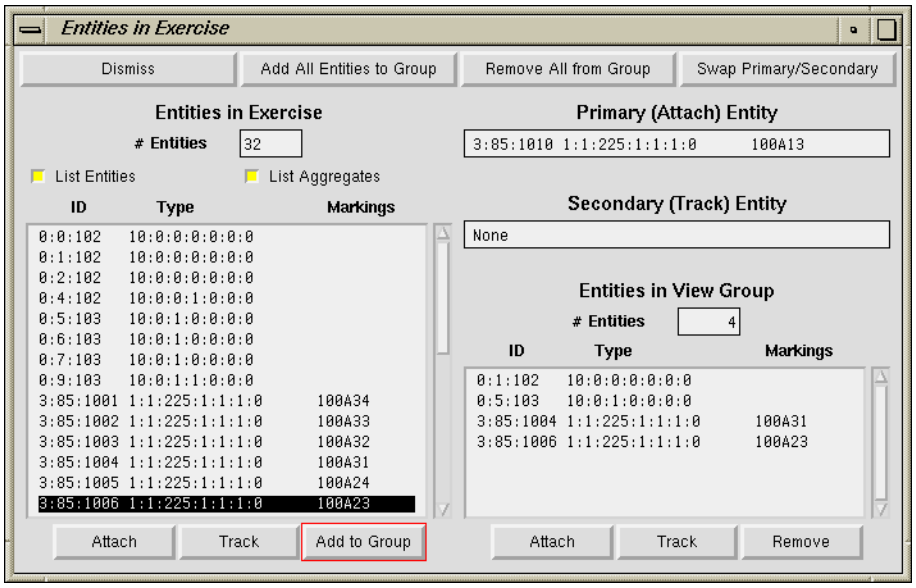


Figure 9-4. Entity Lists

> To limit the number of entities in the Entities in Exercise list, edit the **maxEntsInGuiList** parameter in *params.mtl*:

```
(setqb maxEntsInGuiList 1500)
```

Replace the original number with a different value. This parameter affects only the list, and has no effect on the number of entities that the Stealth can process.

> To limit the number of entities that can be included in the view-group, edit the **viewGroupMaxEnts** parameter:

```
(setqb viewGroupMaxEnts 200)
```

Note: **viewGroupMaxEnts** does not just affect the displayed list; it actually restricts the number of entities in the view-group.

9.5. Editing the Exercise ID Menu (DIS only)

The Stealth Control dialog box contains a menu of exercise IDs from which you choose the exercise to which the Stealth subscribes. In the Stealth for SGIs, you can customize this menu by setting a lowest exercise ID, a highest ID, and a space, or step, between available exercises.

For example, you can set 111 as the lowest available exercise ID, and 201 as the highest. If you set a step of 10, then every tenth exercise within that range will be available: exercises 111, 121, 131 ... 201.

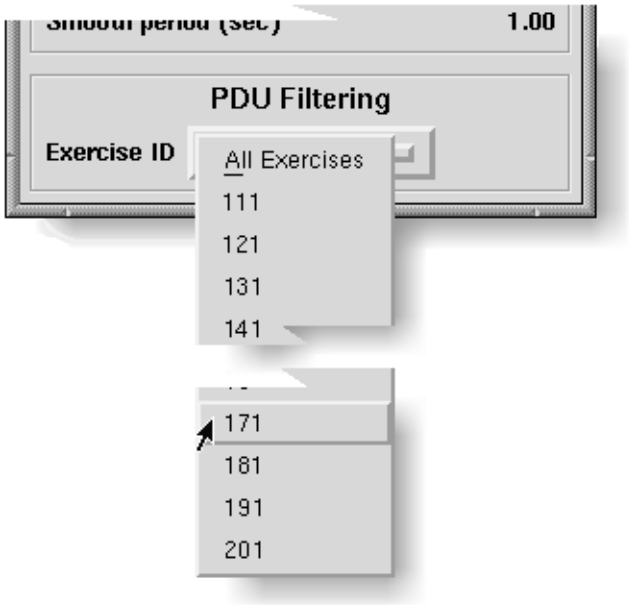


Figure 9-5. Modified Exercise ID list

> To customize the Exercise ID list, edit **guiExIdStart**, **guiExIdEnd**, and **guiExIdStep** parameters in *params.mtl*:

```
(setqb guiExIdStart 1)
(setqb guiExIdEnd 20)
(setqb guiExIdStep 1)
```

9.6. Displaying Stealth Controls on A Separate Terminal (SGI only)

You can display the SGI Stealth's dialog boxes on a separate terminal. Although the graphics display must be displayed on an SGI machine, you can display the control window on any X-Windows capable machine.

To display the control window and dialog boxes on a separate machine:

1. Configure a resource file for the machine that hosts the control window, as described in The Resource File.
2. Start the Stealth with the `-d` command-line option to specify the machine, for example:

   ```
   Stealth -d saturn:0
   ```

   where `saturn` is the machine name and `0` is the number of the display.

The Resource File

The *StealthGUI* file specifies X resources that set initial window locations, color settings for black-and-white monitors, and font settings for non-SGI X displays. The contents of this file should be self-evident to users familiar with X configuration.

However, pay particular attention to the two sections shown below, to ensure that your color and font settings are correct.

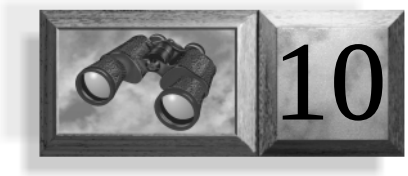
Add or remove exclamation point comment characters as needed.

```
!!! ---------------------- COLORS ----------------------
*foreground:                    black
*background:                    #c1c1c1
!! for color monitors:
*selectColor:                   yellow
*highlightColor:                red
!! for black&white monitors:
!*selectColor:                  black
!*highlightColor:               black
```

```
*plainLabel*fontList:  -*-helvetica-bold-r-normal-*-14-*
!! for SGI
*dynLabel*value.fontList: -*-screen-medium-r-normal-*-13-*
*XmList.fontList:   -*-screen-medium-r-normal-*-13-*
!! for non-SGIs
!*dynLabel*value.fontList: -*-fixed-medium-r-normal-*-13-*
!*XmList.fontList:   -*-fixed-medium-r-normal-*-13-*
```

Figure 9-6. Excerpts from the Stealth X-Resource File

Note: The display must be on an SGI monitor, but the graphical user interface can be on monitors from other manufacturers, such a Sun.



Advanced Options for SGIs

This chapter describes SGI-specific features likely to be of interest to advanced users and those familiar with IRIS Performer. These features can fine-tune various display behaviors, correct visual anomalies, and improve performance. Topics include:

- Setting the Frame Rate, on page 10-2
- Controlling Level-of-Detail Processing, on page 10-6
- Stress Control: Trading Detail for Frame Rate, on page 10-8
- Specifying the Cull Mode, on page 10-10
- Displaying Statistics, on page 10-12
- Multiprocessing, on page 10-14

10.1. Introduction to the Advanced SGI Visual Options

Even the most powerful systems can be pushed to their limit when called upon to process demanding, highly complex scenes rapidly. As the processing limit approaches, display quality begins to degrade and the system is said to be under stress.

On SGI systems, the Stealth lets you manage stress by making trade-offs among certain visual characteristics. For example, you may determine that a highly-detailed image is more important than a high frame rate.

This section describes advanced visual options that most notably affect (and are affected by) system stress. Some options, including stress limits and level-of-detail, are controlled through the Visual Options dialog box. Other options, including frame rate, are controlled from the keyboard.

Because many of these features are based on the Silicon Graphics Performer libraries, you can find additional (and more technical) details in the Performer documentation.

10.2. Setting the Frame Rate

The **frame rate** is the rate at which the Stealth displays updated images. You can specify a fixed frame rate and let the Stealth cope with system stress by reducing detail or skipping frames when necessary. Alternately, in a free-running mode, the Stealth can set its own frame rate in response to the scene complexity, the hardware resources available, and the detail criteria you specify. In free-running mode, the Stealth updates the display as soon as each new image is ready.

10.2.1. Free Running Synchronization Modes

The Stealth provides two frame control modes that allow a variable (free-running) frame rate:

- When the free mode is in effect, the Stealth uses the highest frame rate possible that still permits rendering of the scene at the desired level of detail.
- The limit mode is the same as the free mode, except that the frame rate is not allowed to rise higher than a specified frame rate.

10.2.2. Fixed-Rate Synchronization Modes

When running with a fixed frame rate, it may not be possible to process a complex image within the time allotted for each frame. The Stealth gives you two ways to handle these overrun conditions:

- In locked phase mode, the display of new images is strictly synchronized to your specified frame rate. If a new image is not ready in time, the old image is redisplayed until the next scheduled time interval, then the new image is displayed.

  For example, with a frame rate of 20 frames per second (fps), the Stealth has 50 milliseconds to process and display each new image. If an image takes a little longer to process, the previous image is held over. When the new image is ready, it is not displayed immediately, but at the start of the next 50ms frame boundary.

- In floating phase mode, if an image cannot be processed within the allotted frame time, the Stealth displays that image as soon as it is ready, rather than waiting for the start of the next frame boundary.

  For example, when running at 20 fps, the Stealth has 50ms in which to process each image. If an image takes 53ms to process, the Stealth displays that image as soon as possible after processing is completed, that is, at the next refresh cycle of the system's video hardware. It does not wait for the beginning of the next 50ms frame boundary (as it would in locked phase mode). Thereafter, the Stealth continues to run at 20 fps, but because of the prior processing delay, images are displayed late, at times that are no longer synchronized to the original frame boundaries. The display times are now out of phase with the frame boundaries.

  Figure 10-1 shows what happens when one image (Image 4) requires extra processing time, causing such a phase shift.

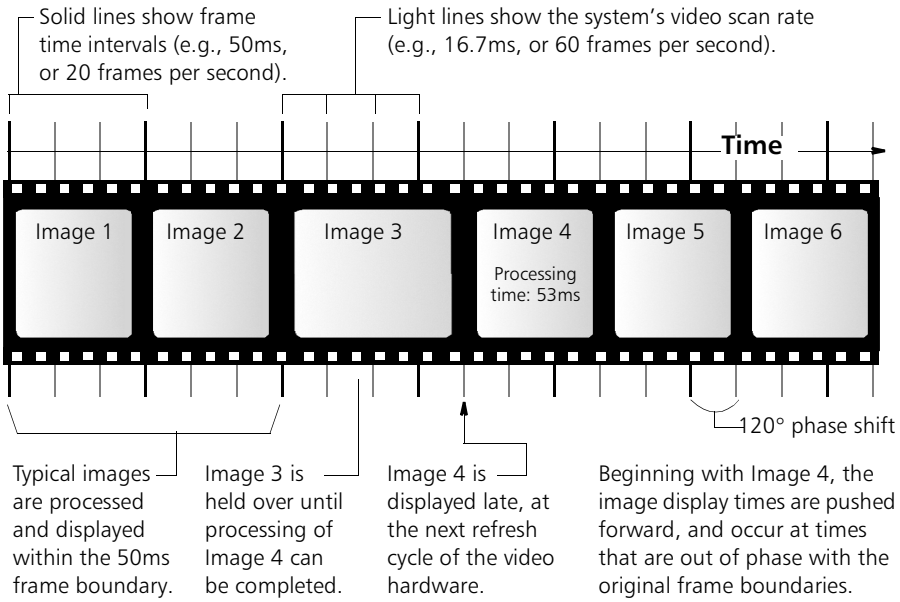


Figure 10-1. Image Timing in Floating Phase Mode

10.2.3. Skipped Frames

If allowed to accumulate, processing delays could add up to a noticeable delay in the action you see in the graphics display. To prevent this delay, the Stealth discards older frames and displays only the most recently processed image data.

10.2.4. Setting the Frame Rate and Synchronization Mode

> To specify the Stealth's default frame rate and synchronization control mode, edit the **ViewState->frameRate** and **ViewState->phase** parameters in *params.mtl*:

```
(setqb ViewState->frameRate n)
(setqb ViewState->phase m)
```

Replace *n* with the desired frame rate.

Note: The displayed frame rate is limited by the refresh rate of your video hardware.

Replace *m* with the integer representing your desired frame control mode:

0	Float	Fixed frame rate with floating phase.
1	Lock	Fixed frame rate with locked phase.
2	Free	Free running, no fixed frame rate (default).
3	Limit	Free running. Frame rate is not fixed, but cannot rise above the specified frame rate (not available in Performer 1.2 versions).

> To override frame rate and synchronization parameters at startup, use the `-r` and `-z` command line options

The `-r` *`rate`* option specifies a frame rate. Use the `-z` *`phase`* option to select a new synchronization control mode, replacing *`phase`* with a number from 0 through 3 as described above.

> To adjust the frame rate and control mode from the keyboard:

Press “R” to increase frame rate, and “r” to decrease it.

Press “p” repeatedly to scroll through control modes in the order shown above.

10.2.5. Determining the Frame Rate and Synchronization Mode

> To determine the current frame rate or control mode, press the “s” key to display the on-screen statistics graph.

The frame rate appears above the graph in the form of `AA.A/TT.T` where *A* represents the achieved frame rate and *T* represents the specified target rate. The current control mode appears at the right of the frame rate.

Figure 10-2. Frame Rate and Control Mode in the Statistics Graph

10.3. Controlling Level-of-Detail Processing

A model file can contain several representations of an entity, each representation having its own degree of detail. When it is not necessary to display an entity in full detail (for example, when it is far away from the eyepoint), the Stealth can use one of the less-detailed representations. The result is reduced stress and improved display performance with little noticeable loss of image quality.

The Stealth chooses which representation to use based, in part, on the entity's perceptibility. Perceptibility is determined by several factors, including the entity's distance from the eyepoint, atmospheric conditions, display resolution, and the field of view setting.

As an entity moves away from the eyepoint or becomes otherwise less perceptible, the Stealth displays a series of progressively less-detailed representations until the entity vanishes completely from the display. The model file contains predefined transition points that mark where one level of detail should fade into the next as perceptibility changes. The range between one transition point and the next is called a switch range.

When stress management is enabled, system stress exerts an additional influence on which level of detail is chosen. The Stealth uses less-detailed representations when stress-reduction is necessary to maintain your specified frame rate. (See "Stress Control: Trading Detail for Frame Rate" on page 10-8.)

10.3.1. Changing the Level-of-Detail Scale

> To change the eyepoint-to-entity distance values used by the Stealth when making level-of-detail choices, adjust the LOD Scale slider in the Visual Options dialog box.

A higher value has the effect of compressing the switch ranges, thereby moving all switch points closer to the eyepoint. This causes detail to drop off more rapidly with distance, reducing system stress, and thereby helping to maintain the frame rate.

To set the LOD scale at startup, use one of the following methods:

- Start the Stealth with the `-s scale` command-line option, where a `scale` value of 1.0 means that the switching range is as specified in the graphics model.
- Specify a default setting by editing the **ViewState–>LODScale** parameter in *params.mtl*.

10.3.2. Transition Blending

When an entity suddenly switches from one level of detail to the next, the transition can appear as a distracting “popping” effect. When transition blending is in effect, this problem is eliminated. As an entity approaches a detail transition point, its current representation fades from full opacity to full transparency, while the next representation fades from transparent to opaque.

> To turn transition blending on or off, select or clear the LOD Fade checkbox (Figure 10-3).

> To change the size of the blend zone, the region in which the transition takes place, adjust the LOD Fade Range slider.

Because the Stealth must process both representations during the transition, you can avoid unnecessary processing by keeping the blend zone as short as possible.

Note: Transition blending is available only when the Stealth is running with a *Reality Engine* or *Infinite Reality* graphics system.

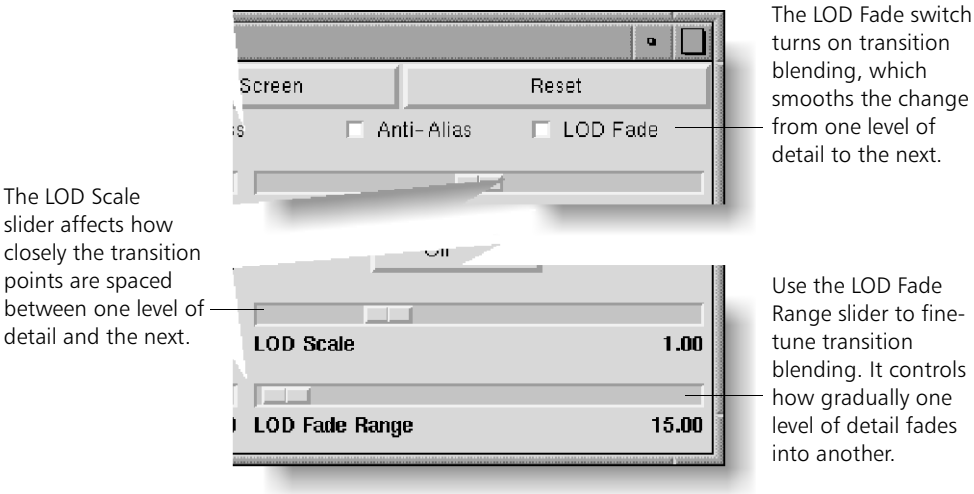


Figure 10-3. Level-of-Detail Controls in the Visual Options dialog box

10.4. Stress Control: Trading Detail for Frame Rate

The Stealth can scale the level of detail up or down to help the system maintain the specified frame rate. When stress processing is in effect, the Stealth evaluates stress after generating each frame. If stress is low, the Stealth generates the next frame at a relatively high level of detail. If stress is high, detail is scaled back in an effort to maintain the frame rate.

The Visual Options dialog box contains a set of stress sliders that let you control how the Stealth balances the competing demands of high detail and consistent frame rate (Figure 10-4).

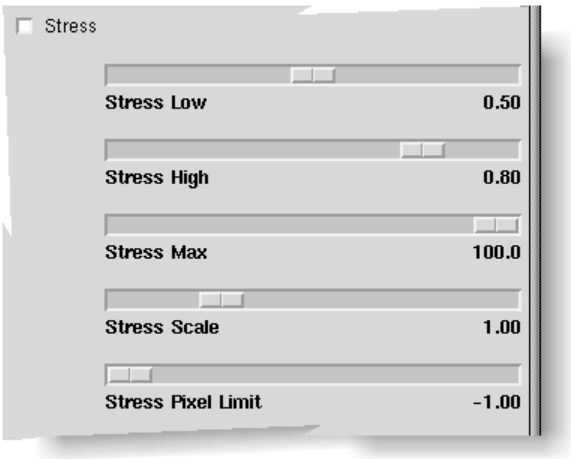


Figure 10-4. Stress Controls in the Visual Options dialog box

10.4.1. Enabling Stress Processing

> To enable stress processing, select the Stress checkbox (near the top of the Visual Options dialog box.)

The stress sliders have no effect unless stress is enabled.

10.4.2. Setting the Stress Points Where Detail-Processing Occurs

> To set the stress levels at which stress processing becomes active, adjust the Stress Low and Stress High sliders.

If system stress rises above your specified Stress High level, the Stealth compresses the switch ranges between level-of-detail transitions, thereby reducing overall detail. (Switch ranges are described in "Controlling Level-of-Detail Processing" on page 10-6.) Likewise, if system stress drops below your specified low level, the Stealth elongates the switch ranges, and consequently representations are displayed with a comparatively higher level of detail.

If the system stress level falls in the range between the specified Stress High and Stress Low, then levels of detail are not modified.

Be careful not to set the Stress High and Stress Low values too close together. Doing so may force the Stealth into oscillation between increased and decreased detail.

Note: For information about how stress values are calculated, see "Dynamic Load Management" in the Performer documentation, and the *pfDraw* manual page.

10.4.3. Setting the Target Maximum Stress Level

As system stress increases beyond your specified Stress High level, the Stealth progressively reduces levels of detail in order to maintain frame rate. The Stress High and Stress Max sliders define a zone in which this detail reduction takes place.

For example, assume Stress High is set to 80 and Stress Max is set to 90. As system stress increases from 80 to 90, the Stealth gradually reduces detail until at stress-level 90, minimum level-of-detail representations are displayed. At that point, detail reduction may be so drastic that some entities and terrain features may not appear at all.

By leaving the Stress Max slider at its default 100% setting, you provide the most gradual range of stress levels in which detail reduction takes place. Set Stress Max to a lower value if you want to create a safety margin for more graceful handling of sudden overloads, and are willing to sacrifice some detail to do so.

10.4.4. Adjusting Stress Settings Globally

> To scale the Stress Low, Stress High and Stress Max values in tandem, adjust the Stress Scale slider.

This allows you to experiment with general stress settings without having to work these controls individually.

10.4.5. Protecting Entities Near the Eyepoint from Stress Effects

> To exclude certain entities from stress-related detail reductions, adjust the Stress Pixel Limit slider.

The slider specifies a number of pixels. If an entity's projected width is greater than the specified number of pixels (implying that the entity is closer to the eyepoint, and therefore appears to be larger), the Stealth does not apply stress-processing to that entity.

> To disable protection from stress processing, set the slider to its leftmost (-1.00) position.

10.5. Specifying the Cull Mode

Culling is the process of discarding database objects which are not within view, and therefore need not be rendered and displayed. The Stealth provides four culling modes, available separately or in combination through the Cull Mode list in the Visual Options dialog box (Figure 10-5). The options are:

- View: A Geode (short for geometry node) is a unit of geometry that the Stealth can consider as one piece when making culling decisions. The View cull mode causes the Stealth to ignore all Geodes whose bounding box lies entirely outside of the viewing area. If the View option is not selected, the entire database is processed.
- GSet: A Geode is made up from smaller units of geometry called GeoSets, or GSets. When a Geode falls partly into the viewing area, the Stealth can process all GeoSets within the Geode, or it can make a separate determination for each GeoSet. When GSet is included in the cull mode, the Stealth makes separate determinations for each GSet.
- Sort: When Sort is included in the cull mode, the Stealth sorts database elements into groups in order to optimize rendering performance.
- Ignore Light Sources: The Stealth normally processes light sources before continuing with other cull processing. When "no lsources" is included in the cull mode, light sources are ignored and lighting effects cancelled.
- The All option enables the View, GSet, and Sort cull actions together, and the None option disables them.

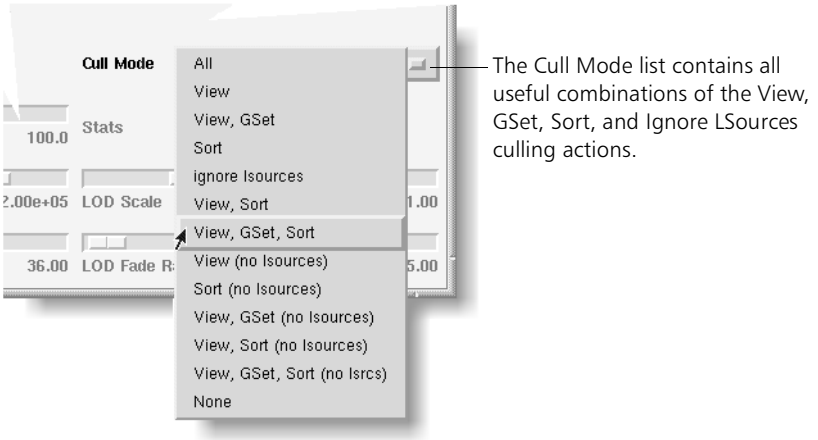


Figure 10-5. Cull Mode list

In most cases, performance is best with the All option. If the statistics graphs show that culling is a significant bottleneck, try using the View, Sort option, then the View option.

> To scroll through the cull modes using the keyboard, press the “F” key while the graphics display is active.

10.6. Displaying Statistics

The Stealth can display transparent statistical graphs showing information about system load and performance, frame rate and other data. The Stats list in the Visual Options dialog box contains the following five options:

- Default - Displays the stage timing graph. This graph shows how processing time is divided among different image rendering stages for the most recent frames.
- Graphics - Displays data about miscellaneous aspects of graphics performance, including cull statistics and visible-geometry data.
- CPU - Displays information about system usage and load. A sample CPU statistics graph appears in Figure 10-6.
- Fill - Displays information about the number of pixels updated since the last statistics update, and depth complexity data.
- Off - Removes the graph from the graphics display.

> To toggle the graph on and off, press the “s” key while the graphics display is active.

Figure 10-6. Sample CPU Statistics Graph

Note: The statistics graph requires processing power, and consequently, has an influence on its own displayed data.

> To send a text version of the statistical information to the console window, press the “S” key while the graphics display is active and the graph is displayed.

A sample text printout appears in Figure 10-7.

```
*-----------------------------------------------------------*
***
*** Average Frame Stats:
*** ---------------------
Num Frames: 59, update period: 2.000000 secs
Frame times (msecs):
        total=98.6 app=2.1 cull=0.4 draw=15.6 isect=0.0
Frame counts: total=59 app=59 cull=59 draw=59 isect=0
Frames=59 Misses: total=2 app+cull=0 draw=0
***
*** Previous Frame Stats:
*** ---------------------
Frame = 1749
Frame times (msecs):
        total=80.3 app=1.8 cull=0.4 draw=13.7 isect=0.0
Frame counts: total=1 app=1 cull=1 draw=1 isect=0
Frames=59 Misses: total=2 app+cull=0 draw=0
*-------------------------------------------------------------
```

Figure 10-7. Stealth Statistics as Displayed in the Console Window

The statistical display is described more fully in the Performer documentation.

10.7. Multiprocessing

You may be able to reduce system stress and improve graphical performance by dividing the Stealth's workload into multiple processes, which may be executed on separate processors, if available.

You can combine or divide the following Stealth tasks:

- Application: Includes operations such as network communications, file operations, positional calculations and message processing.
- Cull: Includes operations related to selecting which database elements to process and display.
- Draw: Includes rendering and other operations related to displaying the image.

Figure 10-8 shows how these tasks can be divided among processes.

> To assign Stealth tasks to multiple processes, start the Stealth with the `-m` *`mode`* option, using the appropriate mode number.

Mode	Division of Workload		
-1	Stealth Decides (default)		
0	Application + Cull + Draw		
2	Application	Cull + Draw	
4	Application + Cull		Draw
6	Application	Cull	Draw

Figure 10-8. Multiprocessing Modes

In most cases, the default setting is best. Multiple processes are used if the machine has multiple processors; a single process is used if the machine has one processor.

10.7.1. Other Process-to-Processor Mapping Options

You can increase efficiency by locking down processes to specific processors, thereby reserving processor resources for the Stealth. To assign processes to specific processors:

1. Log in as root.
2. Run the Stealth with the `-L` option. The `-L` option frees the processors before locking.

   To lock down only the draw process, use the `-D` option.

   To lock down processors without freeing them first, use the `-Z` option.

If you anticipate a long Stealth session, you can assign non-degrading priorities to Stealth processes.

> To assign non-degrading priorities to Stealth processes, start the Stealth with the `-K` option.

Stealth Accessories

This chapter describes supporting software that ships with the Stealth, and optional products that enhance the Stealth.

Topics include:

- Working With Terrain Databases, on page 11-2
- Working with Entity Models, on page 11-6
- Using the Stealth Sound Option (SGI only), on page 11-17

11.1. Working With Terrain Databases

The Stealth for SGIs comes with the following terrain databases:

- A Hunter-Ligget database suitable for use on most current SGI machines
- A Monterey database suitable for use on most current SGI machines
- A smaller version of Hunter-Ligget for use on older or less powerful machines.

These databases are stored in the *./data* directory in your Stealth tree.

The Stealth for PCs comes with the two Hunter-Ligget databases described above.

The Hunter-Ligget database represents an area on the California coast. The low and high-resolution versions of this database are stored in *./data/hunter_low92* and *./data/hunter95*, respectively. Both versions are copyrighted by Silicon Graphics, Inc., MultiGen Inc. and GEC Marconi Ltd. See the *README* file in *./data/hunter95* for usage and distribution restrictions.

The Monterey database is a high-resolution, high-flight database suitable for air vehicle simulations on high-end SGI machines. It comes with A10 and SA6 models in addition to terrain. This database is copyrighted by MultiGen Inc. and Silicon Graphics Inc. See the *README* file in *./data/Monterey* for usage and distribution restrictions.

11.1.1. Loading a Terrain Database

The terrain database is loaded by commands typically contained in a startup configuration files. These commands do the following:

- Specify a list of database parts (a part is a group of files stored at one location), and associate this list of parts with a database name.
- Bind the database name to the **DtDatabaseToLoad** symbol.
- For UTM databases, set the Stealth's UTM origin to match the UTM origin of the database.

For example, the file *IITSEC-92.mtl* contains the following commands that perform the actions to load the low-resolution Hunter-Ligget database:

```
(setq hunter-92-DB (list (list "./data/hunter_low92"
   "HUNTER.flt")))
(setq DtDatabaseToLoad hunter-92-DB)
(set-utm-origin "35:15:0:N,122:3:59:W,0")
```

The first command specifies the list of database parts, and associates that list with the name *hunter-92-DB*. (In this example, the database has only one part.)

The second command binds the database name to the **DtDatabaseToLoad** symbol. The third command sets the UTM origin.

This series of commands can be contained in any *.mtl* file that the Stealth loads at startup. We recommend that you create a separate *.mtl* file for each database you use, then put a single command in *Stealth.mtl* file to load the desired database *.mtl* file.

Multi-Part Databases

A database part is a list containing a path and one or more MultiGen *.flt* files. If your database includes files in multiple directories, put multiple inner `list` commands into your database definition, as in this example of a three-part database:

```
(setq hunter-92-DB (list
   (list "./mydata/dir-2" "A-patch.flt")
   (list "./mydata/dir-2" "B-patch.flt" "C-patch.flt")
   (list "./mydata/dir-3" "D-patch.flt")))
```

Note: In the PC version, the combined length of a filename and its path must not exceed 170 characters. There is no such limit in the SGI version.

Switching Databases

Stealth.mtl contains a pair of commands, each of which loads a version of the Hunter-Ligget database. Initially, the high-resolution version is loaded by default:

```
;(load mtl-path "IITSEC-92.mtl")
(load mtl-path "IITSEC-95.mtl")
```

> To switch versions, delete the comment character (the leading semicolon) from the command you want to use, and insert it before the other command.

If you create your own *.mtl* file for another database, you can add a corresponding `load` command to *Stealth.mtl*. Thereafter you can choose a database by commenting out all the load commands except the one you want.

Starting Without a Database

> To run the Stealth with no database, use the `-T` command-line option at startup.

> To start the Stealth for PCs without a database, comment out the line in *Stealth.mtl* that loads the database.

Note: If the Stealth is set to use geocentric coordinates and you are not loading a database, then you must disable orientation clamping. See "Using a Geocentric Database" on page 11-5 for details.

11.1.2. Specifying a Map Datum

By default, the Stealth uses WGS84 map datum for performing UTM and latitude/longitude/altitude conversions.

> To specify a different datum, use the following commands:

```
(setq datumED50 "6378388.0 6356911.946127 -87. -98. -121.")
   (setqb geodeticMapDatum datumED50)
```

The first command assigns a name to the datum; the second causes the Stealth to use that datum. These commands can be included in any *.mtl* command that the Stealth loads at startup, but you may find it most convenient to put them in the file that loads your database.

See the *IITSEC-95.mtl* file for specifications of WGS84, ED50, NASANAD27, NASBNAD27 and CONUSNAD27 datums.

11.1.3. Using a Geocentric Database

Although all databases that ship with the Stealth use UTM coordinates, the Stealth also supports MultiGen databases that use geocentric coordinates.

> To specify a geocentric or UTM coordinate system, edit the **DtCigFrameKind** parameter in *params.mtl*.

Set the argument to 0 for UTM, or 1 for geocentric:

```
(setqb DtCigFrameKind 1)
```

Your geocentric database must also be accompanied by one or more *.info* files, described in the next section.

Specifying an Offset for Terrain Patches

If a database uses true geocentric coordinates (that is, its origin corresponds to the center of the Earth), then the terrain being represented would be located a great distance from the origin. The single-precision calculations used by Performer and SGI hardware cannot maintain the necessary level of accuracy over such great distances.

Therefore, to reduce the distances used in the calculations, the Stealth works only with geocentric databases that are built within a local coordinate system whose origin is much closer to the location of the actual terrain (within 100km). The axes of this local coordinate system must be aligned to the axes of the DIS geocentric frame.

Each *.flt* file that is the root of a terrain patch must have a corresponding information file that provides the origin of the local coordinate frame. This ASCII file has the same name as the *.flt* file, plus an *.info* extension. For example, for a patch in *tile-01.flt*, a corresponding file named *tile-01.flt.info* would contain the origin's geocentric coordinates in a format like this:

```
4099243.06 3390300.22 3507108.17
```

If your database is very large, some regions may be more than 100km away from the origin specified in the *.info* file. If this happens, you may want to break the database into smaller patches, each with its own nearby origin.

Using Geocentric Coordinates when No Database is Loaded

When entities are ground-clamped, the Stealth also clamps their orientation by default. If you are using geocentric coordinates and not loading a terrain database, orientation-clamping must be disabled.

> To disable orientation, edit the **permitOrientClamping** parameter for your platform in *params.mtl*.

Set the argument to 0 (disable), or 1 (enable):

```
(setqb DtSgiReflectedEntity::permitOrientClamping 1)(SGI)
(setqb DtGvsReflectedEntity::permitOrientClamping 1)(PC)
```

11.2. Working with Entity Models

The Stealth comes with a collection of dozens of vehicle models, possibly all you'll ever need. You can easily provide your own models as well, and make the Stealth aware of them by editing the original model mapping files, or by creating your own.

11.2.1. How the Stealth Maps Model Files to Entities

Model mapping is the process of associating an entity type enumeration with a 3D model contained in a MultiGen OpenFlight (*.flt*) data file. This is done through a series of model-map commands in one or more *.mtl* configuration files.

The model-map Command

A model-map command is structured like this:

```
(model-map entity-type model)
```

In the command, *`entity-type`* is an entity type enumeration. It can represent a single entity type or a class of entity types (through the use of wildcards in the enumeration.) *`model`* refers to the name of the *.flt* file containing the image that will represent the entity. An actual `model-map` command could look like this:

```
(model-map (list 1 2 -1 -1 -1 -1 -1)
   (list "./data/iitsec_models92" "M3DD00002.flt"))
```

In the example, the *`entity-type`* enumeration defines a class of all platform-air vehicles. This broad class is defined by using the wildcard (-1) in several fields. These entities will be displayed using the specified graphics *model* file, which contains an image of an f18 aircraft.

To make the model mapping process more user-friendly, you can use configuration files (like our standard Stealth configuration files) to assign easy-to-use symbolic names to enumerations and model-file names. When using these names, the `model-map` command above looks like this:

```
(model-map DtDomainPlatformAir f18)
```

The use of symbolic names is explained in detail in "Defining Symbolic Names for Entity Types and Models" on page 11-8.

How Command Sequencing Affects Model-Mapping

The sequence in which model-map commands are processed can affect which model is used to represent an entity. This issue arises when a given entity belongs to more than one class of entity types, and those classes are mapped to different visual models. For example, a General Dynamics F-111F belongs to a class of platform entities, of platform-air entities, and a class of platform-air-USA entities, each of which is represented by a different model.

When deciding which model to display for a particular entity, the Stealth searches the list of model mappings for an enumeration that matches the entity's. This search takes place in reverse order, with the most-recently loaded model-mappings examined first, until the Stealth finds any class to which the entity belongs. It then represents the entity using the image model that is mapped to that class.

Therefore, model-map commands should appear in order of specificity of entity-type class, running from most general to most specific. This arrangement ensures that the Stealth uses the most specific model possible to represent each entity. Consider this example:

```
(model-map AllLandVehicles         truck-model)
   (model-map AllTanks             m1-model)
   (model-map RussianTanks         t72-model)
```

With this set of mappings, the Stealth will map all RussianTanks to the t72 model. All tanks that are not Russian tanks will use the m1 model. All land vehicles that are not tanks will use the truck model.

In contrast, if the model mappings are sequenced as follows:

```
(model-map RussianTanks            t72-model)
   (model-map AllTanks             m1-model)
   (model-map AllLandVehicles      truck-model)
```

the Stealth would use the truck model to represent all land vehicles, including tanks, both Russian and non-Russian.

11.2.2. Defining Symbolic Names for Entity Types and Models

The first argument to the model-map command is a list of the seven components of an entity type. The second is a list consisting of a pathname and a filename for a MultiGen *.flt* model. This results in a rather unfriendly looking model-map command:

```
(model-map (list 1 1 225 1 1 0 0)
   (list "./data/myModels" "m1a1.flt"))
```

To make the model-mapping process easier, we suggest defining symbolic names for entity types and for model files, and using those names in the `model-map` line. For example:

```
(setq m1a1-type (list 1 1 225 1 1 0 0))
(setq m1a1-model (list "./data/myModels" "m1a1.flt"))
(model-map m1a1-type m1a1-model)
```

For convenience, the Stealth includes three configuration files that perform the above steps:

- *EntityTypes.mtl* — Gives names to several common entity-type enumerations.
- *Models.mtl* — Gives names to model files.
- *ModelMap.mtl* — Contains model-mapping commands that use the symbolic names defined in the other two files.

The next sections describe these files in detail.

Entity Types

An entity type is a list of seven components as specified by the DIS protocol and HLA RPR FOM. If none of the seven components contains a wildcard (-1) value, then the entity type refers to a specific, narrowly-defined entity. If some components contain a wildcard, then the entity type refers to a class of entities. A larger number of wildcards indicates a broader, more general class.

The *EntityTypes.mtl* file contains commands that give symbolic names to several classes of common entity types (Figure 11-1).

```
(setq DtCategoryPlatformSurfaceFrigate (list 1 3 -1 50 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUSAFrigate (list 1 3 225 50 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUSSRFrigate (list 1 3 222 50 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUKFrigate (list 1 3 224 50 -1 -1 -1))
(setq DtCategoryPlatformSurfaceBattleship (list 1 3 -1 51 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUSABattleship (list 1 3 225 51 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUSSRBattleship (list 1 3 222 51 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUKBattleship (list 1 3 224 51 -1 -1 -1))
(setq DtCategoryPlatformSurfaceHeavyCruiser (list 1 3 -1 52 -1 -1 -1))
(setq DtCategoryPlatformSurfaceUSAHeavyCruiser (list 1 3 225 52 -1 -1 -1))
```

Figure 11-1. Excerpt from the *EntityTypes.mtl* file

Models

The *Models.mtl* file (Figure 11-2) contains commands that give symbolic names to models. In this context, a model is defined as a path and a MultiGen OpenFlight format data file, for example:

```
"./data/iitsec_models92" "M3DD00005.flt"
```

For convenience, *Models.mtl* begins with commands that give symbolic names to frequently-used paths where model files are stored. These symbolic pathnames are then used throughout the file to identify the path, so the above model appears in the file as:

```
iitsec92-path "M3DD00005.flt"
```

The command can also include an optional rotational offset and scaling factor for the image:

```
iitsec92-path "M3DD00005.flt" -90.0 0.1
```

`-90` represents the number of degrees about the z axis. `0.1` is a scaling factor that is applied to the model geometry.

You can associate several different symbolic names with a single model file as needed.

```
(setq sov-4-engine (list iitsec92-path "M3DD00006.flt"))
(setq launcher-down (list iitsec92-path "M3DD00008.flt"))
(setq drone-down (list iitsec92-path "M3DD00009.flt"))
(setq drone-broken (list iitsec92-path "M3DD00010.flt"))
(setq sov-fighter (list iitsec92-path "M3DD00011.flt"))
(setq jet-awacs (list iitsec92-path "M3DD00012.flt"))
(setq prop-awacs (list iitsec92-path "M3DD00013.flt"))
(setq apache (list iitsec92-path "M3DD00014.flt"))
(setq launcher-up (list iitsec92-path "M3DD00007.flt"))
(setq patriot (list iitsec93-path "M3DD00011.flt" -90.0))
(setq pat-launcher (list iitsec93-path "M3DD00012.flt" -90.0))
(setq scud (list iitsec93-path "M3DD00014.flt" -90.0))
(setq transport (list iitsec93-path "M3DD00015.flt" -90.0))
```

Figure 11-2. Excerpt from the *Models.mtl* file

Model Mapping

ModelMap.mtl (Figure 11-3) is an example of a model-mapping file. A series of `model-map` commands map entity-type names to model names.

```
(model-map DtCategoryPlatformAirUSAUtilityHelicopter apache)
(model-map DtCategoryPlatformAirUSACargoHelicopter apache)
(model-map DtCategoryPlatformAirUSSRAttackHelicopter hind)
(model-map DtCategoryPlatformAirUSSRUtilityHelicopter hind)
(model-map DtCategoryPlatformAirUKAttackHelicopter apache)
(model-map DtCategoryPlatformAirUKUtilityHelicopter apache)
(model-map DtCategoryPlatformAirFranceUtilityHelicopter apache)
(model-map DtCategoryPlatformAirGermanyAttackHelicopter hind)
(model-map DtCategoryPlatformLandUSSRArmoredFightingVehicle bmp)
(model-map DtCategoryPlatformLandUSSRArmoredUtilityVehicle bmp)
(model-map DtCategoryPlatformLandUSSRSelfPropelledArtillery bmp)
(model-map DtCategoryPlatformLandUSATank m1-viewpoint)
(model-map DtCategoryPlatformLandUKTank m1-viewpoint)
```

Figure 11-3. Excerpt from the *ModelMap.mtl* file

In the body of the file, mappings are listed in order of specificity, from most general entity-type classes to most specific.

This file begins with a mapping for an all-wildcard entity type so that the Stealth can find a model-mapping to apply to any entity type:

```
(model-map (list -1 -1 -1 -1 -1 -1 -1) (list "N/A" ""))
```

Note: If you create your own custom model-mapping files, it is good practice to begin them with an all-wildcard mapping. However, if your model-map commands are distributed among several files, the all-wildcard line must appear only once, at the beginning of the first model-mapping file loaded.

11.2.3. Adding Your Own Model Mappings

If you just want to change a few model mappings, it may be easiest to modify the existing model mapping files, following the three general steps below. Although the steps refer to our supplied model-mapping files, they also apply to any custom mapping files you have created:

1. Make sure a symbolic name exists (typically in *EntityTypes.mtl*) for the entity type or class you want to map. If not, you may have to add it.
2. Give a symbolic name to your model file (typically in *Models.mtl*), unless you're just changing mappings, but are using our existing models.
3. Add or modify a line to set up the new mapping (typically in *ModelMap.mtl*).

For example, suppose you want to map a new image model to USA tanks, and the image file is *myTank.flt* in the directory */usr/myModels*.

1. Add a line to *Models.mtl* to give the file a symbolic name:

   ```
   (setq myTank (list "/usr/myModels" "myTank.flt"))
   ```

2. To map all USA tanks to this model, comment out the line in *Models.mtl* that defines the current model mapping for USA tanks (with a leading semicolon).
3. Add a line that specifies your new model name:

   ```
   ;(model-map DtCategoryPlatformLandUSATank m1-viewpoint)
      (model-map DtCategoryPlatformLandUSATank myTank)
   ```

If you're adding a new model-map line (as opposed to replacing an existing line), make sure that it occurs after all mappings for broader entity type classes that include your entity type. See "How Command Sequencing Affects Model-Mapping" on page 11-7 for more information about how to sequence model-map commands.

Custom Model Mapping Files

Although model mapping is usually done through the standard Stealth mapping files described in "Adding Your Own Model Mappings" on page 11-11, you can create your own *.mtl* model mapping files.

> To load your own *.mtl* files at Stealth startup, use the `-l` command-line option, or use a `load` command in *Stealth.mtl* (or another *.mtl* file loaded at startup).

If you define symbolic names and map models in the same file, be sure to define the symbolic name earlier in the file, before you use that name in a model-map command.

If desired, you can omit the step of assigning a symbolic name to the model file, and instead, use a *`list`* instead of a model name in the *`model-map`* command:

```
(model-map DtCategoryPlatformLandUSATank
   (list "/usr/myModels" "myTank.flt"))
```

Note: If you load your custom file through a command in *Stealth.mtl*, make sure it is loaded after (or instead of) the Stealth's standard mapping files; Otherwise, your custom mappings will be overridden by the mappings in *ModelMap.mtl*.

11.2.4. The Default Model

If the Stealth is unable to find a model-mapping for a particular entity type, it uses the model specified by the parameter **defaultDefaultModel** in *params.mtl*. This situation usually occurs only when your startup files don't contain any model mappings, or when no startup files are loaded.

> To specify the path to the location of **defaultDefaultModel**, set **defaultDefaultPath**.

```
(setqb defaultDefaultPath "./data/iitsec_models92")
(setqb defaultDefaultModel "M3DD00002.flt")
```

11.2.5. Mapping an Entity Type to No Model

Under some circumstances, you might want to map a particular entity type to no model, thereby making it invisible. For example, our default model mappings instruct the Stealth to use no model to depict other Stealths. (Other Stealths have an entity type of all zeros.)

> To map an entity type to no model, map the entity type to a model with an empty filename:

```
(model-map (list 0 0 0 0 0 0 0) (list "N/A" ""))
   ; show nothing for Stealths
```

11.2.6. Mapping Aggregate Symbols

> To map the aggregate enclosure and icon, use mappings in the following format:

```
(agg-volume-map entity_type force_id model)
(agg-icon-map entity_type force_id model)
```

where:

entity_type is an enumeration of the entity type in the aggregate.

force_id is a number indicating the Force ID of the aggregate.

model is the pathname of the directory where the models are located and the name of the file to associate with this aggregate enclosure or icon.

For example:

```
(agg-volume-map (list 1 1 225 1 -1 -1 -1) 0 (list
   "/usr/home/myhome/stealth" "aggregate.flt"))
```

> To map the size of the icon at different levels, set the **agg-icon-scale** parameter in a configuration file.

(agg-icon-scale h_1 h_2 ... h_n)

h_1, h_2, through h_n is the height, in meters, of the aggregate icon at each level at which the Stealth displays aggregates. h_1 is the height of the icon at Level 0, h_2 is the height of the icon at Level 1, and so on. For example:

```
(agg-icon-scale 10 30 60 90)
```

11.2.7. Mapping a Visual Representation to a Stealth

Because Stealths are mapped to no model, they are normally not visible in your graphics display, even when they are present in the virtual world and listed in your entity list. If you want to display visual representations of Stealths, map a visual model to the Stealth's entity enumeration (all zeros).

> To map a visual model to the Stealth's entity enumeration, locate the following line in *ModelMap.mtl*, and insert a semicolon at the beginning to comment it out:

```
(model-map (list 0 0 0 0 0 0 0) (list "N/A" ""))
```

Add a modified version of the line, replacing the second list with the name of the model you want to use for representing Stealths:

```
;(model-map (list 0 0 0 0 0 0 0) (list "N/A" ""))
   (model-map (list 0 0 0 0 0 0 0) my-stl-model)
```

11.2.8. Models from Viewpoint Datalabs

The *./data/viewpoint* directory contains a set of models from Viewpoint Datalabs. These models conform to the WRM DIS Entity Model Specification, so their articulated parts display at their proper orientation in the Stealth graphics display. For example, the M1A1's turret and gun and the Scud launcher's erector appear in their correct position and orientation. Some of these models also support the switching between normal and destroyed appearances.

For more information about the Viewpoint models included with the Stealth, see the *README* file in the *./data/viewpoint* directory. For more information about other models available from Viewpoint, visit their Web site at www.viewpoint.com.

11.2.9. Articulated Parts, Attached Parts and Entity Appearances

Some MultiGen OpenFlight files contain certain information specified by the *WRM Entity Model Specification for DIS Interoperability.* This information makes it possible for the Stealth to depict the state of an entity's articulated and attached parts correctly, and to switch among different entity appearances (for example, destroyed).

Note: Althought the WRM Model Specification was developed for DIS, it is also being used for HLA.

Specifically, these models contain information about:

- Which articulated part types are associated with which pieces of geometry.
- Which pieces of geometry correspond with which entity appearances.
- Locations of attached part stations and attaching points.

For information about the WRM specification, see Appendix C, *WRM Specification*.

Setting the Attaching Point for Attached Parts

If a model file does not contain the attaching point information required by the WRM Model Specification, you can specify the information in an MTL configuration file instead. Typically, you enter this information in *Models.mtl* or in your own custom configuration file that maps symbolic names to image files.

On the line that maps a symbolic name to the attached part's image file, you can specify how the model should be scaled, and set the position of the point at which it attaches to the carrying entity.

By default, the Stealth positions an attached part so that its origin attaches to the attachment station of the carrying entity.

To change the location of the part's attaching point:

1. Locate the corresponding model's line in *Models.mtl*.
2. Add the positional offset after the rotational offset and scale factor as shown in Figure 11-4.

Rotational offset — Scale factor

```
(setq missile-image "./data/my-models" "missile.flt" 0.0 1.0 0.0 0.0 3.0)
```

X, Y and Z positional offsets

Figure 11-4. Placement information for an attached part

The example in Figure 11-4 gives the symbolic name *missile-image* to the specified image file. The image will not be rotated or scaled. If used as an attached part, it will attach to the carrying entity's attachment station at a point 3.0 meters above the part's own origin.

11.3. Programming the Aggregate Health Meter

The health meter display (located below the aggregate's icon) is controlled by information in the variable data section in aggregate state messages. The data consists of pairs of data IDs, which identify the meaning of the data, and the data value. Table 11-1 describes the contents of the health meter data section.

Table 11-1: Health Meter data

Data ID	Means percent of aggregate in state	Color
1000	No damage	green
1001	Mobility kill	yellow
1002	Firepower kill	orange
1003	Destroyed	red

The data value associated with each Data ID is the percentage of the members of the aggregate in the particular state. The total should equal 100.

The data type for each value is 32 bit unsigned integer.

11.3.1. Using VR-Link to Program the Health Meter

To program the health meter independently of the protocol, retrieve the *DtAggregateStateRepository* from the *DtAggregatePublsher*.

The class *DtAggregateStateRepository* has a function to set the variable data for the health meter. You need to do the following for each of the four parts of the health meter:

1. Create an instance of *DtVariableDatumRecord*. This class is described in *varDatumRec.h*.
2. Use setDatumBitLength() to set the bit length to 32.
3. Use setDatumID() to set the data ID to one of the four values described in Table 11-1.
4. Use setDatumValU32() to set the data value (the percentage of aggregate members in the data ID state) as a 32 bit unsigned integer.
5. Use setNumberOfDatumRecords() to set the number of data records to 4 for the four health meter states (or, if you have variable data besides health information, increment the current number of data records by 4.) This function is part of the class *DtAggregateStateRepository* and is described in the file *aggregateSR.h*.
6. Set the variable data record in the Aggregate State Repository by calling setVariableDatumRecord().

There are similar functions in the AggregateState PDU if you are programming in DIS, amd want to deal directly with the PDU, but the protocol-independent method is recommended.

11.4. Using the Stealth Sound Option (SGI only)

The Sound Option brings the sounds of the virtual battlefield to SGI Stealth users. It offers a range of features that complement the Stealth's 3D out-the-window view:

- Stereo or quadraphonic output.
- Simultaneous play of up to sixteen simultaneous audio events.
- Doppler effects.
- User-configurable mapping between sounds and events.
- A basic collection of battlefield sound files.
- Support for using a separate machine for sound processing.

The Sound Option includes its own documentation in a separate pamphlet. For information about purchasing the Sound Option, call or e-mail MÄK Technologies' sales department.

11.4.1. Loading the Sound Option at Startup

> To cause the Stealth to look for the Sound Option at startup, and if it is installed, to load it, add the following line in *Stealth.mtl*:

```
(load mtl-path "stSoundOpt.mtl")
```

If you do not have the Sound Option, you can speed the startup process slightly by commenting this command out with a leading semicolon.

> To specify whether sound is turned on by default at startup, set the **startWithSoundOn** parameter in *params.mtl*.

Set the parameter to *1* for *on* or *0* for *off*.

```
(setqb startWithSoundOn 1)
```

> To turn sound on or off during the session, check the Sound checkbox in the Stealth Options dialog box.

Startup Options

This appendix describes the Stealth's command-line options. Although many of the startup options are available only on SGI systems, most of these options have a corresponding setting in *params.mtl* which is available for both the PC and SGI.

The options are listed twice:

- Alphabetical Listing of Command Line Options, on page A-2
- Command Line Options by Function, on page A-6

A.1. Alphabetical Listing of Command Line Options

Table A-1 summarizes the Stealth command-line options. Command-line options are case sensitive. With the exception of `-N`, options can appear in any order.

Some SGI options pertain to the IRIS Performer functionality that underlies portions of the Stealth. For information about these options, please see your Performer documentation.

Table A-1: Startup Options, Alphabetical (Sheet 1 of 4)

Option	SGI only	Description
`-A` *addr*		DIS only: Sets the destination address for outgoing PDUs. Defaults to the machine's broadcast address. (“Setting the Target Address for Outgoing PDUs”, page 8-3)
`-b`		Causes the Stealth to send state updates onto the network. (“Making the Stealth Visible to Other Applications”, page 8-7)
`-c` *num*	✓	Sets the number of channels, up to 3. Defaults to -1, which lets the multipipe setting determine the number of channels. (“Channels and Pipes”, page 6-31)
`-C` *p1,p2[,p3]*	✓	Assigns specific pipes to channels. (“Assigning Channels to Specific Monitors”, page 6-32)
`-D`	✓	Lock down Draw process (only) to a specific processor. (“Other Process-to-Processor Mapping Options”, page 10-15)
`-d` *hostname*:0	✓	Selects the machine used to display the Stealth's windows. (“Displaying Stealth Controls on A Separate Terminal (SGI only)”, page 9-12)
`-E` *mode*	✓	Specifies the initial Earth/Sky mode (“Setting the Initial Earth/Sky Mode”, page 6-24). Replace *mode* with: `tag` tag clear mode `clear` regular clear `sky` sky only `skygrnd` sky and ground `skyclear` sky and clear
`-g`	✓	Use GANGDRAW with Multipipe. (Performer option)
`-G` *lat,lon,alt*		Sets initial eyepoint location to a specified geodetic position. (“Setting Eyepoint Position from the Command Line”, page 7-9)
`-h`	✓	Displays a help message and command summary, then exits.
`-i` *force-id*		Specifies the force ID contained in outgoing messages. (“Force ID”, page 8-6)

Table A-1: Startup Options, Alphabetical (Sheet 2 of 4)

Option	SGI only	Description
`-I` *`count`*	✓	Starts the Stealth, prints statistics for *`count`* frames, then exits.
`-j` *`level`*		Stealth notify level: controls which Stealth and VR-Link information is displayed in the console. Set *`level`* as follows: `-j 0` Reports fatal messages. `-j 1` Reports fatal and warning messages. `-j 2` Reports fatal, warning, and info messages (default). `-j 3` Reports all messages, including debug statements.
`-k` *`count`*	✓	Combine billboards up to size *`count`*. (Performer option)
`-K`	✓	Prevents the priority of Stealth processes from degrading. (“Other Process-to-Processor Mapping Options”, page 10-15)
`-l` *`mtl-file`* `-l` *“`mtl-command`”* `-l` *`parm=value`*		Lets you perform any of the following from the command line at startup: - load an *.mtl* (MÄK Technologies lisp) configuration file. - execute an mtl command. - set a parameter. This option is commonly used to load configuration files in addition to (or instead of) *Stealth.mtl*. See page B-11 for examples and more information.
`-L`	✓	Free up processors, then lock down application, cull, and draw processes to specific processors. Requires that you log in as root. (“Other Process-to-Processor Mapping Options”, page 10-15)
`-m` *`mode`*	✓	Specifies how application, cull, and draw processes are distributed among multiple processors. Defaults to -1. (“Multiprocessing”, page 10-14) Set *`mode`* to: `-1` Stealth decides `0` Application + Cull + Draw `2` Application | Cull + Draw `4` Application + Cull | Draw `6` Application | Cull | Draw
`-M` *`mode`*	✓	Sets the multipipe *`mode`*. Defaults to -1. (“Channels and Pipes”, page 6-31) Set *`mode`* to: `-1` Stealth decides `0` Use a single pipe `1` Use a separate pipe for each channel `2` Hyperpipe mode

Table A-1: Startup Options, Alphabetical (Sheet 3 of 4)

Option	SGI only	Description
`-n` *`level`*	✓	Performer notify level: controls which Performer information is displayed in the console. Set *`level`* as follows: 1 Reports only fatal messages. 2 As in level 1, plus serious warnings. 3 As in level 2, plus other warnings. 4 As in level 3, plus information and floating point exceptions. 5 As in level 4, plus debug information. 6 As in level 5, plus floating point debug information.
`-N`		Prevents loading of the *Stealth.mtl* configuration file. This option is most often used in conjunction with another command that loads an alternate configuration file. If used, `-N` must be the first option to appear on the command line.
`-o` *`value`* `-O` *`value`*	✓	Set builder mode to *`value`*. (Performer option)
`-p` *`x,y,z`*		Sets initial eyepoint position in UTM or geocentric coordinates. ("Setting Eyepoint Position from the Command Line", page 7-9)
`-P` *`portnumber`*		DIS only: Specifies the UDP port the Stealth uses to receive and send data. ("Selecting the UDP Port", page 8-2)
`-q` *`optimize`*	✓	Optimize Scene GStates into single Scene pfGeoState. (Performer 2.0)
`-Q` *`optimize`*	✓	Flattens tree and removes empty nodes. (Performer option)
`-r` *`rate`*	✓	Specifies target frame *`rate`* in Hertz.
`-R` *`mode`*	✓	Retessellate input geometry. *`mode`* is 0 (off) or 1 (on). (Performer option)
`-s` *`scale`*	✓	Set the initial Level-of-Detail scale factor. ("Changing the Level-of-Detail Scale", page 10-6)
`-S` *`mcast-addr`*	✓	DIS only: Subscribes the Stealth to the specified multicast address. To subscribe to several multicast addresses, use this option more than once on the command line. ("Subscribing to Multicast Groups", page 8-2)
`-t` *`visual-ID`*	✓	Specifies the GLX visual ID as a hexadecimal integer. (Performer option)
`-T`		Prevents the loading of a terrain database, for quick startup. ("Starting Without a Database", page 11-3)

Table A-1: Startup Options, Alphabetical (Sheet 4 of 4)

Option	SGI only	Description
`-v` *gap-angle*	✓	When displaying a scene across multiple monitors, sets the field-of-view gap between displays, in degrees. (“Assigning Channels to Specific Monitors”, page 6-32)
`-V` *num*		DIS only: Sets the DIS protocol version for PDUs sent onto the network. (“Viewing and Attaching to Other Stealths”, page 8-8) Set *num* to: 3for DIS 2.0.3 4for DIS 2.0.4 5for IEEE 1278.1 6for DIS 2.1.4
`-w` *file.out* `-w` *file.ext*	✓	Writes the scene in ASCII format to *file.out*, or in the format specified by the filename extension to *file.ext*. (Performer option)
`-W` *size*, or `-W` *width,hgt*	✓	Sets the initial size of the graphics display, in pixels. Specify a single *size* value for a square window, or a separate *width* and *height*. (“Window Position”, page 9-7)
`-x` *ExName* `-x` *ExNumber*		In HLA: Sets the federation execution name. Defaults to “VR-Link” (“HLA Parameters”, page 8-5) In DIS: Sets the exercise ID. Defaults to 0. (“Exercise ID”, page 8-4)
`-X`	✓	Disable the exit confirmation prompt. (“Exit Confirmation (SGI only)”, page 9-8)
`-y` *ext mode val*	✓	Set loader *mode* for file extension *ext* to *val*. (Performer 2.0 option)
`-Y` *ext alias*	✓	Substitute file extension *alias* for file extension *ext*. (Performer 2.0 option)
`-z` *phase*	✓	Sets the frame synchronization mode. (“Setting the Frame Rate and Synchronization Mode”, page 10-4) Set *phase* to: 0Float – Fixed frame rate with floating phase. 1Lock – Fixed frame rate with locked phase. 2Free – Free running, no fixed frame rate (default). 3Limit – Free running. Frame rate is not fixed, but cannot rise above the specified frame rate (not available in Performer 1.2 versions).
`-Z`	✓	Lock down Stealth processes to specific processors; don’t free the processors first. (“Other Process-to-Processor Mapping Options”, page 10-15)

A.2. Command Line Options by Function

Table A-2 summarizes the Stealth command-line options, grouped by function. Command-line options are case sensitive. With the exception of `-N`, options can appear in any order. The last category lists options pertaining to IRIS Performer. For information about these options, please see your Performer documentation.

Table A-2: Startup Options by Function (Sheet 1 of 5)

Option	SGI only	Description
		General Options
`-h`	✓	Displays a help message and command summary, then exits.
`-l` *`mtl-file`* `-l` *`"mtl-command"`* `-l` *`parm=value`*		Lets you perform any of the following from the command line at startup: - load an *.mtl* (MÄK Technologies lisp) configuration file. - execute an mtl command. - set a parameter. This option is commonly used to load configuration files in addition to (or instead of) *Stealth.mtl*. See page B-11 for examples and more information.
`-N`		Prevents loading of the *Stealth.mtl* configuration file. This option is most often used in conjunction with another command that loads an alternate configuration file. If used, `-N` must be the first option to appear on the command line.
		Startup State
`-G` *`lat,lon,alt`*		Sets initial eyepoint location in geodetic coordinates. ("Setting Eyepoint Position from the Command Line", page 7-9)
`-p` *`x,y,z`*		Sets initial eyepoint position in UTM or geocentric coordinates. ("Setting Eyepoint Position from the Command Line", page 7-9)
`-T`		Prevents the loading of a terrain database, for quick startup. ("Starting Without a Database", page 11-3)
`-W` *`size`*, or `-W` *`width,hgt`*	✓	Sets the initial size of the graphics display, in pixels. Specify a single *`size`* value for a square window, or a separate *`width`* and *`height`*. ("Window Size", page 9-7)
		Interface
`-d` *`hostname`*`:0`	✓	Selects the machine used to display the Stealth's windows. ("Displaying Stealth Controls on A Separate Terminal (SGI only)", page 9-12)
`-X`	✓	Disable the exit confirmation prompt. ("Exit Confirmation (SGI only)", page 9-8)

Table A-2: Startup Options by Function (Sheet 2 of 5)

Option	SGI only	Description
		Visuals
`-c` *`num`*	✓	Sets the number of channels, up to 3. Defaults to -1, which lets the multipipe setting determine the number of channels. (“Channels and Pipes”, page 6-31)
`-C` *`p1,p2[,p3]`*	✓	Assigns specific pipes to channels. (“Assigning Channels to Specific Monitors”, page 6-32)
`-E` *`mode`*	✓	Specifies the initial Earth/Sky mode (“Setting the Initial Earth/Sky Mode”, page 6-24). Replace *`mode`* with: `tag` tag clear mode `clear` regular clear `sky` sky only `skygrnd` sky and ground `skyclear` sky and clear
`-M` *`mode`*	✓	Sets the multipipe *`mode`*. Defaults to -1. (“Channels and Pipes”, page 6-31) Set *`mode`* to: `-1` Stealth decides `0` Use a single pipe `1` Use a separate pipe for each channel `2` Hyperpipe mode
`-v` *`gap-angle`*	✓	When displaying a scene across multiple monitors, sets the field-of-view gap between displays, in degrees. (“Setting the Spacing Between Views”, page 6-32)
		Network and Communications
`-A` *`addr`*		DIS only: Sets the destination address for outgoing PDUs. Defaults to the machine’s broadcast address. (“Setting the Target Address for Outgoing PDUs”, page 8-3)
`-b`		Causes the Stealth to send state updates onto the network. (“Making the Stealth Visible to Other Applications”, page 8-7)
`-i` *`force-id`*		Specifies the force ID contained in outgoing messages. (“Force ID”, page 8-6)
`-P` *`portnumber`*		DIS only: Specifies the UDP port (DIS port) the Stealth uses to receive and send data. (“Selecting the UDP Port”, page 8-2)
`-S` *`mcast-addr`*	✓	DIS only: Subscribes the Stealth to the specified multicast address. To subscribe to several multicast addresses, use this option more than once on the command line. (“Subscribing to Multicast Groups”, page 8-2)

Table A-2: Startup Options by Function (Sheet 3 of 5)

Option	SGI only	Description
`-V` *num*		DIS only: Sets the DIS protocol version for PDUs sent onto the network. (“Setting the DIS Protocol Version for Outgoing PDUs”, page 8-8) Set *num* to: 3 for DIS 2.0.3 4 for DIS 2.0.4 5 for IEEE 1278.1 6 for DIS 2.1.4
`-x` *ExName* `-x` *ExNumber*		In HLA: Sets the federation execution name. Defaults to “VR-Link” (“HLA Parameters”, page 8-5) In DIS: Sets the exercise ID. Defaults to 0. (“Exercise ID”, page 8-4)
		Notification
`-j` *level*		Stealth notify level: controls which Stealth and VR-Link information is displayed in the console. Set *level* as follows: `-j 0` Reports only fatal messages. `-j 1` Reports fatal and warning messages. `-j 2` Reports fatal, warning, and info messages (default). `-j 3` Reports all messages, including debug statements.
`-n` *level*	✓	Performer notify level: controls which Performer information is displayed in the console. Set *level* as follows: 1 Reports only fatal messages. 2 As in level 1, plus serious warnings. 3 As in level 2, plus other warnings. 4 As in level 3, plus information and floating point exceptions. 5 As in level 4, plus debug information. 6 As in level 5, plus floating point debug information.
		Advanced Processing
`-D`	✓	Lock down Draw process (only) to a specific processor. (“Other Process-to-Processor Mapping Options”, page 10-15)
`-K`	✓	Prevents the priority of Stealth processes from degrading. (“Other Process-to-Processor Mapping Options”, page 10-15)
`-L`	✓	Free up processors, then lock down application, cull, and draw processes to specific processors. Requires that you log in as root. (“Other Process-to-Processor Mapping Options”, page 10-15)

Table A-2: Startup Options by Function (Sheet 4 of 5)

Option	SGI only	Description
`-m` *`mode`*	✓	Specifies how application, cull, and draw processes are distributed among multiple processors. Defaults to -1. ("Multiprocessing", page 10-14) Set *`mode`* to: `-1` Stealth decides `0` Application + Cull + Draw `2` Application | Cull + Draw `4` Application + Cull | Draw `6` Application | Cull | Draw
`-r` *`rate`*	✓	Specifies target frame *`rate`* in Hertz.
`-s` *`scale`*	✓	Set the initial Level-of-Detail scale factor. ("Changing the Level-of-Detail Scale", page 10-6)
`-Z`	✓	Lock down Stealth processes to specific processors; don't free the processors first. ("Other Process-to-Processor Mapping Options", page 10-15)
`-z` *`phase`*	✓	Sets the frame synchronization mode. ("Setting the Frame Rate and Synchronization Mode", page 10-4) Set *`phase`* to: `0` Float – Fixed frame rate with floating phase. `1` Lock – Fixed frame rate with locked phase. `2` Free – Free running, no fixed frame rate (default). `3` Limit – Free running. Frame rate is not fixed, but cannot rise above the specified frame rate (not available in Performer 1.2 versions).
		Performer Options
`-g`	✓	Use GANGDRAW with Multipipe.
`-I` *`count`*	✓	Print statistics for *`count`* frames, then exit.
`-k` *`count`*	✓	Combine billboards up to size *`count`*.
`-q` *`optimize`*	✓	Optimize Scene GStates into single Scene pfGeoState.
`-Q` *`optimize`*	✓	Flattens tree and removes empty nodes.
`-R` *`mode`*	✓	Retessellate input geometry. *`mode`* is 0 (off) or 1 (on).
`-o` *`value`* `-O` *`value`*	✓	Set builder mode to *`value`*.
`-t` *`visual-ID`*	✓	Specifies the GLX visual ID as a hexadecimal integer.
`-w` *`file.out`* `-w` *`file.ext`*	✓	Writes then scene in ASCII format to *file.out*, or in the format specified by the filename extension to *file.ext*.

Table A-2: Startup Options by Function (Sheet 5 of 5)

Option	SGI only	Description
`-y` *`ext mode val`*	✓	Set loader *`mode`* for file extension *ext* to *`val`*.
`-Y` *`ext alias`*	✓	Substitute file extension *`alias`* for file extension *`ext`*.

Configuring The Stealth

You can customize several of the Stealth's defaults and features by modifying configuration files. This appendix describes the two primary Stealth configuration files, *Stealth.mtl* and *params.mtl*. It also discusses environment variables.

This appendix contains:

- The Stealth.mtl File, on page B-2
- The params.mtl File, on page B-4
- Specifying Parameters from the Command Line, on page B-17

B.1. The Stealth.mtl File

The *Stealth.mtl* file is loaded at startup unless you use the `-N` command-line option to prevent it from loading.

In its unmodified form, the primary job of *Stealth.mtl* is to specify a directory path where other configuration files are stored, then to load those files. A printout of *Stealth.mtl* follows.

```
;;; -*- Lisp -*-
;; ****************************************************************
;;                     Stealth Configuration File
;;
;;      Copyright 1993-8 MaK Technologies, Inc.  All rights reserved.
;;
;; ****************************************************************

;; This is the main Configuration file that gets called when running
;; the Stealth.  It uses MAK Technologies Lisp (mtl).

;; SET UP DIRECTORY PATHS - where other configuration files may be found
(setq mtl-path (list "." "./config" "../config" "../../config"))

;; SOUND (SGI only)
;; if you don't want the Stealth to even try to load the Sound Option
;; DSO, comment out the following lines:
(if (equal AudioWorks 1)
   (load mtl-path "stSoundOpt.mtl")
)

;; LOAD STEALTH MTL FILES
(load mtl-path "params.mtl")      ;; Stealth parameters
(load mtl-path "viewsave.mtl")    ;; Saved view states (if any)

;; MODEL-MAPPING
;; EntityTypes.mtl - gives symbolic names to DIS Entity Type
    enumerations
;; Models.mtl and Viewpoint.mtl - gives symbolic names to .flt models
;; ModelMap.mtl - maps entity types to .flt models

;; disVersion is defined by the Stealth
(cond
   ((equal disVersion 3) (load mtl-path "EntityTypes3.mtl"))
   (t                    (load mtl-path "EntityTypes.mtl"))
)

(load mtl-path "Models.mtl")
(load mtl-path "Viewpoint.mtl")
(load mtl-path "ModelMap.mtl")

;; VIEWPOINT DATALABS MTL
;; The models referenced in Viewpoint.mtl conform to the WRM Entity
;; Flight Model Specification for DIS Interoperability (see
;; doc/modelSpec.txt).  This enables the Stealth to correctly
;; articulate the gun and turret of the M1A1 tank, switch between
;; normal and destroyed appearances of the Scud Launcher, and depict
;; the attaching of the missle to the launcher.
;;
;; These models are provided courtesy of Viewpoint DataLabs.  See
```

```
;; data/viewpoint/README for information about  ordering other models
;; from Viewpoint DataLabs.

;; LOAD TERRAIN DATABASE
;; The Stealth data directory contains two versions of the
;; Hunter-Liggett terrain database.  The IITSEC-95 TDB contains more
;; features than the 92 version, but runs slowly on older low-end
;; machines.  Users, esp. those with low-end graphics, can use the 92
;; TDB by swapping the comment (the leading ;) from IITSEC-92 to
;; IITSEC-95.

;; These databases were provided by MultiGen and SGI for the I/ITSEC
;; shows in 1992 and 1995.  Users of the IITSEC-95 database should
;; first read and conform to the licensing information in
;; data/hunter95/README.  The copyright to hunter95 belongs to
;; Silicon Graphics, Inc., Multigen Inc. and GEC Marconi Ltd.

;(load mtl-path "IITSEC-92.mtl")
(load mtl-path "IITSEC-95.mtl")
```

B.2. The params.mtl File

The *params.mtl* file determines many of the Stealth's defaults, and lets you control several Stealth attributes that are not accessible through the GUI. For example, you can control:

- Visual elements such as ground and sky color, clouds, fog, and time of day.
- Processing options such as smoothing and ground clamping.
- Network parameters such as the default UDP port.
- DIS defaults such as the entity timeout period, and which exercises the Stealth monitors.
- Characteristics of the heads-up display.
- Behavior of special effects such as smoke and explosions (SGI).
- Sensor volume color and other attributes (SGI).
- GUI options such as the initial size of the graphics display (SGI), whether the controls are visible at startup (SGI), and how exit confirmation works (SGI).
- Spaceball sensitivity (SGI).
- The messages displayed in the Stealth console (SGI).

The following listing groups them by function. Where appropriate, a cross-reference shows where to look in the manual for more information.

If a parameter applies only to the SGI or PC platform, an S or P appears at the left of the parameter to indicate which platform.

An example *params.mtl* file is included in section 2.2.15, "Sample params.mtl File".

B.2.1. Entity, Eyepoint and Effects Behavior

	(setqb viewFiredMode 0)	p. 4-16
	(setqb viewFiredWaitTime 5.0)	p. 4-16
S	(setqb DtSgiReflectedEntity::clampThreshold2 1000000.0)	p. 7-3
P	(setqb DtGvsReflectedEntity::clampThreshold2 1000000.0)	p. 7-3
S	(setqb DtSgiReflectedEntity::permitGroundClamping 1)	p. 7-3
P	(setqb DtGvsReflectedEntity::permitGroundClamping 1)	p. 7-3
S	(setqb DtClampTerrainHits 1)	p. 7-3
	(setqb StViewAttachable::whoToSmooth 3)	p. 7-5
	(setqb smoothPeriod 1.0)	p. 7-5
	(setqb viewFloor 6.0)	p. 7-7
	(setqb viewStartAltIfDb 1250.0)	p. 7-10
	(setqb viewStartLatSouthIfDb 0.045000)	p. 7-10
	(setqb viewStartAltIfNdb 100.0)	p. 7-10
	(setqb viewStdOffset 25.0)	p. 7-10
	(setqb viewStdPitch -5.0)	p. 7-10
	(setqb processViewControl 2)	p. 7-11
S	(setqb DtSgiReflectedEntity::permitOrientClamping 1)	p. 11-5
P	(setqb DtGvsReflectedEntity::permitOrientClamping 1)	p. 11-5

B.2.2. Visuals (Environmental)

	(setqb ViewState->timeOfDay 0.800000)	p. 6-16
S	(setqb high_alt 38000000.0)	p. 6-25
S	(setqb low_alt 70000.0)	p. 6-25
S	(setqb altitudeDependentClearColor 0)	p. 6-25
S	(setqb groundColor[0] 0.140000)	p. 6-25
S	(setqb groundColor[1] 0.250000)	p. 6-25
S	(setqb groundColor[2] 0.360000)	p. 6-25
S	(setqb skyColor[0] 0.4)	p. 6-25
S	(setqb skyColor[1] 0.5)	p. 6-25
S	(setqb skyColor[2] 1.0)	p. 6-25
S	(setqb ViewState->skyHorizonAngle 7.0)	p. 6-26
S	(setqb ViewState->earthSkyMode -1)	p. 6-24
	(setqb ViewState->farFogRange 200000.0)	p. 6-19
	(setqb ViewState->nearFogRange 100.0)	p. 6-19
	(setqb ViewState->fog 0)	p. 6-28
	(setqb cloudFile "cloud.flt")	p. 6-30
	(setqb cloudPath "./data/clouds:./data/hunter94")	p. 6-30
	(setqb cloudHeight 3000.0)	p. 6-30
	(setqb cloudOffsetX 46320.328000)	p. 6-30
	(setqb cloudOffsetY -139036.141000)	p. 6-30

B.2.3. Visual (Miscellaneous)

	`(setqb ViewState->farClip 20000.0)`	p. 6-17
	`(setqb ViewState->nearClip 2.0)`	p. 6-17
	`(setqb initialFov 36.0)`	p. 6-18
S	`(setqb useTexEffects 1)`	p. 6-29
S	`(setqb cheapEffects 0)`	p. 6-29
	`(setqb FilterRange 0.0)`	p. 6-20
	`(setqb WeAreFiltering 0)`	p. 6-20
S	`(setqb ViewState->backface 1)`	p. 6-28
S	`(setqb NumChans -1)`	p. 6-31
S	`(setqb Multipipe -1)`	p. 6-31
S	`(setqb channelsRightToLeft 0)`	p. 6-32
S	`(setqb fovGap 0.0)`	p. 6-32
S	`(setqb ViewState->frameRate 30.0)`	p. 10-4
S	`(setqb ViewState->phase 2)`	p. 10-4
S	`(setqb ViewState->LODscale 1.0)`	p. 10-6
P	`(setqb gvsAntialiasing` *n*`)`	p. 6-20

B.2.4. Heads-Up Display

`(setqb overlayMode 1)`	p. 6-3
`(setqb overlayTextHorJust1 1)`	p. 6-5
`(setqb overlayTextHorJust2 1)`	p. 6-5
`(setqb overlayTextPos1[0] 0.0)`	p. 6-5
`(setqb overlayTextPos1[1] 99.0)`	p. 6-5
`(setqb overlayTextPos2[0] 0.0)`	p. 6-5
`(setqb overlayTextPos2[1] -99.0)`	p. 6-5
`(setqb overlayTextStr1[0] "MaK Technologies")`	p. 6-5
`(setqb overlayTextStr1[1] "VR-Link Stealth")`	p. 6-5
`(setqb overlayTextStr1[2] "")`	p. 6-5
`(setqb overlayTextStr1[3] "")`	p. 6-5
`(setqb overlayTextStr2[0] "")`	p. 6-5
`(setqb overlayTextStr2[1] "")`	p. 6-5
`(setqb overlayTextStr2[2] "")`	p. 6-5
`(setqb overlayTextStr2[3] "")`	p. 6-5
`(setqb overlayTextVerJust1 2)`	p. 6-5
`(setqb overlayTextVerJust2 0)`	p. 6-5
`(setqb overlayDfltCol 0xFF00FF00)`	p. 6-6
`(setqb overlayFadeColor 0x8000FF00)`	p. 6-6
`(setqb overlayTextColor1 0xFF00FF00)`	p. 6-6
`(setqb overlayTextColor2 0xFF00FF00)`	p. 6-6

B.2.5. Sensor Volumes (DIS and SGI only)

S	`(setqb stealthDisplayEmPdu 1)`	p. 6-8
S	`(setqb MySensorVolume::initMaxAngle 10.0)`	p. 6-10
S	`(setqb MySensorVolume::initShowLines 1)`	p. 6-10
S	`(setqb MySensorVolume::initRadiusExp 0.100000)`	p. 6-11
S	`(setqb MySensorVolume::initRadiusSF 100.0)`	p. 6-11
S	`(setqb MySensorVolume::hiFreq 1000000000.0)`	p. 6-12
S	`(setqb MySensorVolume::loFreq 800000000.0)`	p. 6-12
S	`(setqb MySensorVolume::hiPRFreq 3000.0)`	p. 6-12
S	`(setqb MySensorVolume::loPRFreq 100.0)`	p. 6-12
S	`(setqb MySensorVolume::initColorIndicates 2)`	p. 6-12
S	`(setqb MySensorVolume::dfltFColor[0] 1.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltFColor[1] 0.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltFColor[2] 1.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltFColor[3] 0.500000)`	p. 6-13
S	`(setqb MySensorVolume::dfltNColor[0] 1.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltNColor[1] 1.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltNColor[2] 1.0)`	p. 6-13
S	`(setqb MySensorVolume::dfltNColor[3] 0.500000)`	p. 6-13
S	`(setqb MySensorVolume::lifetime 100.0)`	p. 6-13

B.2.6. Protocol-Independent Communication

`(setqb stealthForceID 0)`	p. 8-6
`(setqb entityTimeout 12.0)`	p. 8-6
`(setqb broadcast 0)`	p. 8-7

B.2.7. DIS-Specific Communication

	`(setqb addressString "")`	p. 8-3
	`(setqb disPort 3000)`	p. 8-2
	`(setqb DtProtocolVersionToSend 5)`	p. 8-8
	`(setqb exerciseId 0)`	p. 8-4
S	`(setqb guiExIdStart 1)`	p. 9-11
S	`(setqb guiExIdStep 1)`	p. 9-11
S	`(setqb guiExIdEnd 20)`	p. 9-11
	`(setqb ignoreStealths 1)`	p. 8-8
	`(setqb iitsec94stealthPdu 0)`	p. 8-7
	`(setqb stealthEntity 1)`	p. 8-3
	`(setqb stealthHost 1)`	p. 8-3
	`(setqb stealthSite 140)`	p. 8-3
	`(setqb timeStampType 0)`	p. 7-4

B.2.8. HLA-Specific Communication

```
    (setqb execName “VR-Link”)                          p. 7-4
    (setqb fedName “MAK Stealth”)                       p. 8-2
```

B.2.9. User Interface

```
    (setqb sgMinUpdatePeriod 0.500000)                  p. 9-2
S   (setqb SgDynLatLon::dmsDisplay 1)                   p. 9-4
P   (setqb SgDmsDisplay 1)                              p. 9-4
    (setqb sgAngleMenuInit 1)                           p. 9-3
    (setqb sgLengthMenuInit 0)                          p. 9-3
    (setqb sgTimeMenuInit 0)                            p. 9-3
    (setqb sgRotGain 0.017453)                          p. 9-5
    (setqb sgTranGain 1.0)                              p. 9-5
S   (setqb sballRotGain 0.0000000174)                   p. 9-6
S   (setqb sballSphericalGain 0.00000000174)            p. 9-6
S   (setqb sballTranGain 0.0000007)                     p. 9-6
S   (setqb WinOriginX 270)                              p. 9-7
S   (setqb WinOriginY 0)                                p. 9-7
S   (setqb WinSizeX -1)                                 p. 9-7
S   (setqb WinSizeY -1)                                 p. 9-7
S   (setqb sgInitialOpenWins 1)                         p. 9-9
S   (setqb exitConfirmCmd "xconfirm")                   p. 9-8
S   (setqb exitConfirmDfltYes 1)                        p. 9-8
S   (setqb exitConfirmNo "No")                          p. 9-8
S   (setqb exitConfirmOpts                              p. 9-8
            "-icon question -geometry 300x100+500+400")
S   (setqb exitConfirmText "Exit the Stealth?")         p. 9-8
S   (setqb exitConfirmTitle "Exit Confirmation")        p. 9-8
S   (setqb exitConfirmYes "Yes")                        p. 9-8
S   (setqb splashFile "") ; "./splash.rgb"              p. 9-7
    (setqb viewGroupMaxEnts 200)                        p. 9-10
    (setqb maxEntsInGuiList 1500)                       p. 9-10
```

B.2.10. Coordinates

```
    (setqb geodeticMapDatum "")                         p. 11-4
    (setqb DtCigFrameKind 0)                            p. 11-5
```

B.2.11. Notification (warning messages)

```
    (setqb DtNotifyLevel 2)
```
VR-Link Developer’s Guide, Section 6.6 “Diagnostics”

```
S   (setqb NotifyLevel 2)
```
Performer notify level

B.2.12. Miscellaneous

```
    (setqb defaultDefaultModel
             "./data/iitsec_models92/M3DD00002.flt")
S   (setqb defaultDefaultPath "./data/iitsec_models92")
S   (setqb startWithSoundOn 1)
P   (setqb windowsDataPath "pathname")
P   (setqb fbf_resolution "resolution")
```

p. 11-12
p. 11-12
p. 11-17
p. 6-33
p. 6-33

B.2.13. Performer-Based Parameters (SGI only)

The following parameters work with the Performer code on which portions of the Stealth are based. See your Performer documentation for information.

```
S   (setqb GangDraw 0)
S   (setqb PrioritizeProcs 0)
S   (setqb ProcSplit -1)
S   (setqb ViewState->procLock 0)
```

B.2.14. Special-Case Parameters

The following parameters are included in the parameter file for use under special circumstances. We recommend that you leave these parameters at their original values unless specifically instructed to change them by a MÄK Technologies support specialist.

```
(setqb DtEffectEntHitFlashRatio 2.0)
(setqb DtEffectEntHitPeriod 3.0)
(setqb DtEffectFlashMask 1)
(setqb DtEffectFlashPeriod 0.300000)
(setqb DtEffectLumpGrav 2.250000)
(setqb DtEffectLumpStart 0.500000)
(setqb DtEffectLumpVel 8.0)
(setqb DtEffectRotStyle 1)
(setqb DtEffectSmokeColor 0)
(setqb DtEffectSmokeHeight 40.0)
(setqb DtEffectSmokePeriod 20.0)
(setqb DtEffectSmokeSize 20.0)
(setqb DtEffectSmokeWindE 30.0)
(setqb DtEffectSmokeWindN 0.0)
(setqb DtEffectTerHitPeriod 3.0)
(setqb DtFunnelDebugOn 0)
(setqb DtLispDebugOn 0)
(setqb DtLogUtilDebugOn 0)
(setqb DtMuzzleFlashLargePush 2.500000)
(setqb DtMuzzleFlashLargeSize 2.0)
(setqb DtMuzzleFlashSmallPush 1.0)
(setqb DtMuzzleFlashSmallSize 0.300000)
(setqb DtNetDebugOn 0)
(setqb DtOldUtmRtns 0)
(setqb DtOutboundThresholdDebugOn 0)
(setqb DtSmoothDebugOn 0)
(setqb DtSmoothZDebugOn 0)
(setqb DtTerrainHitLargeScale 1.0)
(setqb DtTerrainHitSmallScale 0.200000)
(setqb DtTmpDebugOn 0)
(setqb DtxArrow::interval 25)
(setqb DtxArrow::interval0 250)
(setqb dynamicSceneOrigin 1)
(setqb fogClearMax 2e5)
(setqb fogClearMin 500.0)
(setqb high_scale 50.0)
(setqb IpcRcvrDebugOn 0)
(setqb IpcSndrDebugOn 0)
(setqb isectGroundOnly 0)
(setqb low_scale 1.0)
(setqb sceneOriginDeadband 5.0)
(setqb SgDynLatLon::dmsPrec 1)
(setqb terrainCollideMask 32)
(setqb viewSphericalHeadingOffset 0)
```

2.2.15. Sample *params.mtl* File

This section lists a *params.mtl* file showing the order in which parameters are listed in the default file.

```
;; ******************************************************************
;;                     Stealth Configuration File
;;
;;      Copyright 1998 MaK Technologies, Inc.  All rights reserved.
;;
;; ******************************************************************

;; General parameters

(setqb processViewControl 2)
(setqb broadcast 0)
(setqb WeAreFiltering 0)
(setqb FilterRange 0.0)
(setqb stealthForceID 0)
(setqb stealthMarking "blue")

(setqb ViewState->backface 1)
(setqb ViewState->frameRate 30.0)
(setqb ViewState->nearClip 2.0)
(setqb ViewState->farClip 20000.0)
(setqb ViewState->timeOfDay 0.800000)

(setqb dynamicSceneOrigin 1)
(setqb DtCigFrameKind 0)
(setqb initialFov 36.0)

(setqb smoothPeriod 1.0)
(setqb StViewAttachable::whoToSmooth 3)

(setqb high_alt 38000000.0)
(setqb high_scale 50.0)
(setqb low_alt 70000.0)
(setqb low_scale 1.0)

(setqb useModelEffects 0)
(setqb useTexEffects 1)
(setqb viewFiredMode 0)
(setqb viewFiredWaitTime 5.0)
(setqb viewFloor 6.0)
(setqb viewGroupMaxEnts 200)
(setqb viewSphericalHeadingOffset 0)
(setqb viewStartAltIfDb 1250.0)
(setqb viewStartAltIfNdb 100.0)
(setqb viewStartLatSouthIfDb 0.045000)
(setqb viewStdOffset 25.0)
(setqb viewStdPitch -5.0)
(setqb viewWideGroupMaxPsiRate 1.0)

;; Model/Database parameters

(setqb cloudPath "./data/clouds ./data/hunter94")
(setqb cloudFile "cloud.flt")
(setqb cloudHeight 3000.0)
(setqb cloudOffsetX 46320.328000)
(setqb cloudOffsetY -139036.141000)
```

```
(setqb defaultDefaultPath "./data/iitsec_models92")
(setqb defaultDefaultModel "M3DD00002.flt")
(setqb geodeticMapDatum "")

;; GUI parameters

(setqb sgAngleMenuInit 1)
(setqb sgInitialOpenWins 1)
(setqb sgLengthMenuInit 0)
(setqb sgMinUpdatePeriod 0.500000)
(setqb sgRotGain 0.017453)
(setqb sgTimeMenuInit 0)
(setqb sgTranGain 1.0)
(setqb maxEntsInGuiList 1500)

;; 2D Overlay parameters

(setqb overlayDfltCol 0xFF00FF00)
(setqb overlayFadeColor 0x8000FF00)
(setqb overlayMode 1)
(setqb overlayTextColor1 0xFF00FF00)
(setqb overlayTextColor2 0xFF00FF00)
(setqb overlayTextHorJust1 1)
(setqb overlayTextHorJust2 1)
(setqb overlayTextPos1[0] 0.0)
(setqb overlayTextPos1[1] 99.0)
(setqb overlayTextPos2[0] 0.0)
(setqb overlayTextPos2[1] -99.0)
(setqb overlayTextStr1[0] "MaK Technologies")
(setqb overlayTextStr1[1] "VR-Link Stealth")
(setqb overlayTextStr1[2] "")
(setqb overlayTextStr1[3] "")
(setqb overlayTextStr2[0] "")
(setqb overlayTextStr2[1] "")
(setqb overlayTextStr2[2] "")
(setqb overlayTextStr2[3] "")
(setqb overlayTextVerJust1 2)
(setqb overlayTextVerJust2 0)

;; Debugging parameters

(setqb DtLispDebugOn 0)
(setqb DtLogUtilDebugOn 0)
(setqb DtNetDebugOn 0)
(setqb DtNotifyLevel 2)
(setqb DtOldUtmRtns 0)
(setqb DtOutboundThresholdDebugOn 0)
(setqb DtSmoothDebugOn 0)
(setqb DtSmoothZDebugOn 0)
(setqb DtTmpDebugOn 0)

;; HLA-only parameters

(if (equal hla 1)
   (sequence

      (setqb execName "VR-Link")
      (setqb fedName "MAK Stealth")
      (setqb entityTimeout -1.0)  ;; -1 means don't time entities out
```

```
   )
)

;; DIS-only parameters

(if (equal hla 0)
   (sequence

      (setqb addressString "")
      (setqb disPort 3000)
      (setqb DtProtocolVersionToSend 5)
      (setqb entityTimeout 12.0)
      (setqb exerciseId 0)
      (setqb guiExIdEnd 20)
      (setqb guiExIdStart 1)
      (setqb guiExIdStep 1)
      (setqb ignoreStealths 1)
      (setqb iitsec94stealthPdu 0)
      (setqb stealthEntity 1)
      (setqb stealthHost 1)
      (setqb stealthSite 140)
      (setqb timeStampType 0)

   )
)

;; Performer-only parameters (SGI)

(if (equal Performer 1)
   (sequence

      (setqb DtSgiReflectedEntity::clampThreshold2 1000000.0)
      (setqb DtSgiReflectedEntity::permitGroundClamping 1)
      (setqb DtSgiReflectedEntity::permitOrientClamping 1)

      ;; Sensor volumes are DIS-only
      (if (equal hla 0)
         (sequence

            (setqb MySensorVolume::dfltFColor[0] 1.0)
            (setqb MySensorVolume::dfltFColor[1] 0.0)
            (setqb MySensorVolume::dfltFColor[2] 1.0)
            (setqb MySensorVolume::dfltFColor[3] 0.500000)
            (setqb MySensorVolume::dfltNColor[0] 1.0)
            (setqb MySensorVolume::dfltNColor[1] 1.0)
            (setqb MySensorVolume::dfltNColor[2] 1.0)
            (setqb MySensorVolume::dfltNColor[3] 0.500000)
            (setqb MySensorVolume::hiFreq 1000000000.0)
            (setqb MySensorVolume::hiPRFreq 3000.0)
            (setqb MySensorVolume::initColorIndicates 2)
            (setqb MySensorVolume::initMaxAngle 10.0)
            (setqb MySensorVolume::initRadiusExp 0.100000)
            (setqb MySensorVolume::initRadiusSF 100.0)
            (setqb MySensorVolume::initShowLines 1)
            (setqb MySensorVolume::lifetime 100.0)
            (setqb MySensorVolume::loFreq 800000000.0)
            (setqb MySensorVolume::loPRFreq 100.0)
            (setqb stealthDisplayEmPdu 1)

         )
```

```
)

;; Special effects
(setqb DtClampTerrainHits 1)
(setqb DtEffectEntHitFlashRatio 2.0)
(setqb DtEffectEntHitPeriod 3.0)
(setqb DtEffectFlashMask 1)
(setqb DtEffectFlashPeriod 0.300000)
(setqb DtEffectLumpGrav 2.250000)
(setqb DtEffectLumpStart 0.500000)
(setqb DtEffectLumpVel 8.0)
(setqb DtEffectRotStyle 1)
(setqb DtEffectSmokeColor 0)
(setqb DtEffectSmokeHeight 40.0)
(setqb DtEffectSmokePeriod 20.0)
(setqb DtEffectSmokeSize 20.0)
(setqb DtEffectSmokeWindE 30.0)
(setqb DtEffectSmokeWindN 0.0)
(setqb DtEffectTerHitPeriod 3.0)
(setqb DtExplosionImage.duration 5.0)
(setqb DtExplosionImage.file "kaPOW.flt")
(setqb DtExplosionImage.scale 2.0)
(setqb DtFlashImage.duration 0.500000)
(setqb DtFlashImage.file "kaPOW.flt")
(setqb DtFlashImage.scale 0.300000)
(setqb DtFunnelDebugOn 0)
(setqb DtMuzzleFlashLargePush 2.500000)
(setqb DtMuzzleFlashLargeSize 2.0)
(setqb DtMuzzleFlashSmallPush 1.0)
(setqb DtMuzzleFlashSmallSize 0.300000)
(setqb DtTerrainHitLargeScale 1.0)
(setqb DtTerrainHitSmallScale 0.200000)

(setqb DtSceneObject::pfTransparencyMode 1)

(setqb DtxArrow::interval 25)
(setqb DtxArrow::interval0 250)

(setqb GangDraw 0)
(setqb IpcRcvrDebugOn 0)
(setqb IpcSndrDebugOn 0)
(setqb Multipipe -1)

(setqb NotifyLevel 2)
(setqb NumChans -1)
(setqb NumPipes -1)
(setqb PrioritizeProcs 0)
(setqb ProcSplit -1)

(setqb SgDynLatLon::dmsDisplay 1)
(setqb SgDynLatLon::dmsPrec 1)

(setqb ViewState->LODscale 1.0)
(setqb ViewState->earthSkyMode -1)
(setqb ViewState->farFogRange 200000.0)
(setqb ViewState->fog 0)
(setqb ViewState->frameRate 30.0)

;; groundHeight will be set in mainStealth if not changed from
;; its magic number
```

```
        ;; (setqb ViewState->groundHeight 12345.6789) ; typically -10 or -100
        (setqb ViewState->nearFogRange 100.0)
        (setqb ViewState->phase 2)
        (setqb ViewState->procLock 0)
        (setqb ViewState->skyHorizonAngle 7.0)

        (setqb WinOriginX 270)
        (setqb WinOriginY 0)
        (setqb WinSizeX -1)
        (setqb WinSizeY -1)

        (setqb altitudeDependentClearColor 0)

        (setqb channelsRightToLeft 0)
        (setqb cheapEffects 0)

        (setqb exitConfirmCmd "xconfirm")
        (setqb exitConfirmDfltYes 1)
        (setqb exitConfirmNo "No")
        (setqb exitConfirmOpts "-icon question -geometry 300x100+500+400")
        (setqb exitConfirmText "Exit the Stealth?")
        (setqb exitConfirmTitle "Exit Confirmation")
        (setqb exitConfirmYes "Yes")

        (setqb fogClearMin 500.0)
        (setqb fogClearMax 2e5)

        (setqb fovGap 0.0)

        (setqb groundColor[0] 0.140000)
        (setqb groundColor[1] 0.250000)
        (setqb groundColor[2] 0.360000)

        (setqb isectGroundOnly 0)

        ;; Rotational sensitivity for SpaceBall
        (setqb sballRotGain 0.0000000174)

        ;; Spherical sensitivity for SpaceBall
        (setqb sballSphericalGain 0.00000000174)

        ;; Translational sensitivity for SpaceBall
        (setqb sballTranGain 0.0000007)

        (setqb sceneOriginDeadband 5.0)

        (setqb skyColor[0] 0.4)
        (setqb skyColor[1] 0.5)
        (setqb skyColor[2] 1.0)

        (setqb splashFile "")
        (setqb startWithSoundOn 1)

        (setqb terrainCollideMask 32)

    )
)

;; OpenGVS-only parameters (WIN32)
```

```
(if (equal OpenGVS 1)
   (sequence

      ;; Resolution of framebuffer for 3DFX hardware
      (setqb fbf_resolution "800x600")

      ;; Enable/disable antialiasing for 3DFX hardware
      (setqb gvsAntialiasing 0)

      ;; Enable/disable single monitor mode for 3DFX hardware
      (setqb SingleMonitor 0)

      ;; Location of explosion and fire bitmap directories
      (setq windowsDataPath ".\data\EffectsWIN32")

      ;; Settings for ground clamping
      (setqb DtGvsReflectedEntity::clampThreshold2 1000000.0)
      (setqb DtGvsReflectedEntity::permitGroundClamping 1)
      (setqb DtGvsReflcetedEntity::permitOrientClamping 1)

   )
)
```

B.3. Specifying Parameters from the Command Line

The `-l` command-line option lets you:

- Set a parameter from the command line, thereby overriding any corresponding value that was set previously by a parameter file.
- Execute any *.mtl* (MÄK Technologies lisp) command.
- Load an *.mtl* configuration file.

Setting Parameters and Executing *.mtl* Commands

Both of the examples commands below start the Stealth and set the **FilterRange** parameter to 500 meters. The first command sets the parameter directly; the second shows how to accomplish the same task by executing an mtl command.

> To set a parameter from the command line, use the `-l` option followed by the parameter, an equals sign, and the argument, for example,

```
Stealth -l FilterRange=500.0
```

> To execute an mtl command, enter it just as you would enter it in a configuration file, but within quotation marks:

```
Stealth -l "(setqb FilterRange 500.0)"
```

Loading a Configuration File

> To load additional (or alternative) configuration files at startup, use the `-l` option as shown:

```
Stealth -l myParams.mtl
```

The Stealth processes the specified file after loading *Stealth.mtl*, so the settings in your specified file will override corresponding settings in *Stealth.mtl*.

If you want to use the specified file instead of *Stealth.mtl*, include `-N` as the first option on the command line to bypass *Stealth.mtl*.

B.4. Environment Variables

This section describes miscellaneous environment variables for the PC and SGI platforms.

2.4.1. Specifying Share Memory for Performer (SGI only)

You can set the size of the Performer shared memory arena, using the environment variable ST_SHARED_ARENA_SIZE. The default is 256000000 (256 MB), but larger values might be desired if you want to use a very large terrain database and if your machine has more than 256MB of RAM.

B.4.2. Configuring the Network Mask (PC only)

The Stealth for PCs expects to run on a class C network using a netmask of 255.255.255.0. If your machine is configured to use a different netmask, create a DtNetmask environment variable to reflect your netmask.

The DtNetmask variable should specify your netmask in a C-language style hexadecimal format. For example:

If your netmask is	255.255.0.0
the hexadecimal representation is:	0xFFFF0000

The default value of DtNetmask is 0xFFFFFF00, which corresponds to the netmask 255.255.255.0.

To set the DtNetmask variable for Windows NT:

1. Open the Windows NT Control Panel.
2. Open the System applet.
3. Enter the DtNetmask variable name and appropriate hexadecimal value in the fields at the bottom of the System dialog box.
4. Click Set.

To set the DtNetmask variable for Windows 95:

1. Add the following line to your AUTOEXEC.BAT file. Replace the hexadecimal number with one that represents your netmask:

   ```
   SET DtNetmask=0xFFFF0000
   ```

2. Reboot the PC.

WRM Specification

Some MultiGen OpenFlight files contain certain information specified by the *WRM Entity Model Specification for DIS Interoperability.* This information makes it possible for the Stealth to depict the state of an entity's articulated and attached parts correctly, and to switch among different entity appearances.

This appendix contains information that can help you build entity models that comply with the WRM specification, or add that compliance to existing models.

The WRM specification was developed by MÄK Technologies, Paradigm Simulation Inc., SAIC-War Breaker, and MultiGen, Inc.

Note: Although the WRM specification was developed for DIS, it is used in the HLA RPR FOM.

C.1. Background

In order for the Stealth to be able to change the state of a model based on incoming information, certain information about the model must be available to it. For example, which piece of the model's geometry is associated with which articulated part, and which piece of a model is associated with a particular entity appearance attribute.

This appendix describes a method of encoding information within a MultiGen OpenFlight format model, so that the Stealth can make these associations. For the most part, information is associated with a MultiGen bead by including it as a comment associated with the bead. Comments that contain information that is meant to be interpreted by the Stealth begin with the token, `@dis`.

The Stealth will depict the movement of articulated parts and changes in entity appearance only when using models constructed to this specification. The Stealth will also place attached parts at specified attachment station when the attaching and attached models have been constructed to this specification.

This appendix represents a subset of the Model Specification for DIS Interoperability (version 001), a document developed by MÄK Technologies, Paradigm Simulation Inc., MultiGen Inc. and SAIC for the ARPA War Breaker project. For more details on any of the sections of this file, please refer to that document. You can obtain the Model Specification at:

```
ftp.multigen.com pub/wrm.pdf
```

Although the Stealth implements only a subset of the functionality enabled by the Model Specification, we recommend that models conform to as much of the Specification as is appropriate for the model, to promote compatibility with future versions of the Stealth, and with Stealths from other vendors.

C.2. General Information

This section lists a series of points for meeting the specification:

- The origin of the model's coordinate system should be located as follows, depending on the domain of the entity:
  - Land: on base of vehicle, on axis of yaw rotation.
  - Surface: On axis of center of buoyancy, in plane of waterline for unloaded ship.
  - Subsurface: On axis of center of buoyancy, in plane of waterline for surfaced submarine.
  - Air and Space: At center of gravity.
- The model's orientation should be such that the positive X axis points through the right side of the vehicle, the positive Y axis points through the front of the model, and the positive Z axis points through the top of the model. This is the normal orientation of Multigen models.
- The top-level node of the whole model should have the following two-line comment:

  ```
  @dis version_number spec_version
  @dis entity_type entity_type
  ```

  for example,

  ```
  @dis version_number 1
  @dis entity_type 1:1:225:1:1:1:0
  ```

  The first line indicates that the model conforms with version 1 of the model spec. The second line indicates that this model represents an M1A1 Abrams tank, since 1:1:225:1:1:1:0 is the enumeration for that entity type.

Note: The Stealth currently ignores the entity type line in the comment, since it uses the *.mtl* configuration files for model mapping.

- Remember that all comments will be parsed by our Stealth application, so spelling counts.

C.3. Articulated Parts

In order for the Stealth to properly depict the state of articulated parts, models must conform to the following specifications:

- There should be one DOF bead for each articulated part. (This means that if there are several LOD's, they should be children of the DOF, and not vice-versa.) Each articulation DOF should be a descendant of the DOF for the part to which it is attached (unless of course the parent part is just the base model itself.) For example, the DOF for a gun should be a descendant of the DOF for a turret.
- Each articulated part DOF bead should have exactly one child, which is a group. All of the geometry and other beads associated with the part should be under this group. This group should have a comment associated with it. The comment should be of the form:

  `@dis articulated_part` *`part-number`*

  where *`part number`* is the enumeration for the particular type of part that this part of the model represents. For example, the part number of a turret is 4096, and the part number of a gun is 4416.

  Therefore the child group of a turret's DOF should be commented with `@dis articulated_part 4096` and the child group of a gun's DOF should be commented with:

  `@dis articulated_part 4416`
- The WRM Model Specification specifies that information about the legal motions of each articulated part be encoded in the comment field as well. Currently, the Stealth does not use this information.
- Do not include static offsets in the DOF attributes. That is, when you set all of the DOF parameters (x, y, z, heading, pitch, roll) to 0, the model should appear in its neutral position.

C.4. Entity Appearances

The Stealth supports switching between different pieces of a model's geometry based on appearance attributes. For instance, a tank's turret should look different if the hatch is open or closed. An entire tank should look different if it is damaged or destroyed.

Switch beads are used to represent a choice between several different children, based on a particular appearance attribute.

We define a switch bead as a group bead with a comment of the form:

```
@dis switch attribute
```

where *attribute* is the name of the attribute which should be used to select a child. (For example, damage, smoke, hatch, etc.) The list of legal appearance attribute names may be found in Table 4.3.5 in the WRM Model Spec.

The children of the switch bead represent the different portions of a model among which the Stealth will select, based on the appearance attribute. If a switch bead is commented with

```
@dis switch hatch
```

it may, for example, have three children containing geometry for a closed hatch, popped hatch, and open hatch.

These children of the switch bead must be commented so that the Stealth knows which child matches which values of the appearance attribute. The comment is of the form:

```
@dis state value-list
```

value-list is of the form *m[,m]+* where *m* is one of the following:

- An integer representing the enumeration of a value that an appearance attribute may take on, for example, 1 for hatch closed.
- Two integers a and b separated by a hyphen, representing all enumerations between a and b inclusive, for example, 2-5 for all states whose enumerations are between 2 and 5.
- The integer -1, which indicates that this child is the default child, to be used when the attribute state matches no values in any children.

For instance, the child of the hatch switch bead that represents a closed hatch might be used when the hatch attribute value is either 0 (not-applicable), 1 (closed), or any value other than those enumerated in other children. This child would be commented:

```
@dis state 0,1,-1
```

The child with the popped hatch geometry should be used when the value is 2 (popped) or 3 (popped with person visible) and is commented:

```
@dis state 2,3
```

The child that contains the open hatch geometry should be used when the value is 4 (open) or 5 (open with person visible) and is commented:

```
@dis state 4,5
```

There may be many switch beads for the same attribute. For example, there may be several pieces of a tank's geometry that are affected by the destroyed attribute.

The WRM Model Spec also discusses the inheritance of appearance attributes from ancestor beads. Performer, and therefore the MÄK Stealth, does not currently support this functionality. To tell the Stealth to, for example, display a camouflaged tank when the paint scheme attribute is set to camouflage, and a normal tank otherwise, the switch bead method described above must be used.

Note: Although the Stealth interprets a group bead with an `@dis` switch comment as a switch bead, and culls out all but one child at run-time based on the current value of an entity's appearance attributes, MultiGen interprets the switch bead no differently than any other group bead. MultiGen assumes that you are displaying all of the children at once. MultiGen Inc. has added the capability for separate switch beads in version 14.1, which the Stealth supports. However, the model spec has not been updated to use new switch beads. Until the Model Spec is updated, the displaying of all appearances at once in MultiGen (or perfly) is unavoidable.

C.5. Attached Parts

An entity might have one or more attached parts - separate entities that are “attached” to one another. For instance, a missile might be attached to a launcher. As far as the Stealth is concerned, the “carrier” and “carried” entities are represented using separate models. The Model Spec includes sections on building models that can carry attached parts and models that can be carried as attached parts.

C.5.1. Building Models That Can Have Attached Parts

When building a model that can have attached parts, you must indicate where on the model the attachment stations are. At each attachment station, place a DOF bead. The DOF should be placed so that if the attached model were to be placed under it, it would have the correct position and orientation. Think of the DOF as a hanger from which to hang the attached part. If an attachment station is on an articulated part, that is, any model attached to the station should move along with the articulated part - the attachment station DOF should appear below the articulation DOF for that part.

The DOF must have one child, which is a group bead. This group must be commented with:

```
@dis attachment_station stationNum
```

where *stationNum* is the enumeration for the particular type of attachment station in question. A value of -1 may be used for *stationNum* to indicate that this is the default station. The group bead should have no children.

C.5.2. Building Models that Can Be Attached Parts

When building a model that can be an attached part, you must indicate the position of the attaching point, that is, the point on the model that should coincide with the attachment station point on the carrying model when it is attached. The position of the attachment point is indicated by placing a DOF bead there. The DOF should be at the very top of the model’s MultiGen bead hierarchy - above any geometry - but geometrically positioned at the attaching point.

The attaching point’s DOF bead must have one child, which is a group bead. The group bead should be commented with:

```
@dis attachment_point
```

The UTM Coordinate System

All databases that ship with the Stealth use Universal Transverse Mercator (UTM) coordinates. There appear to be at least 6 commonly used forms of UTM. Although they may be called something different than the names given them in this appendix, they have the described characteristics. This appendix covers the following information:

- Standard Definition of the UTM, on page D-2
- Arbitrary Offset UTM, on page D-2
- Standard Offset UTM, on page D-2
- Non-Offset UTM, on page D-3
- USGS or Civilian Mapping UTM, on page D-3
- Milgrid UTM, on page D-3
- ModSAF UTM, on page D-3

(Reference: Map Projections - A Working Manual By John P. Snyder, U. S. Geological Survey Professional Paper 1395)

D.1. Standard Definition of the UTM

In general, in UTM, the earth is divided into 60 zones generally 6 degrees wide in longitude. These zones may be further subdivided into quadrangles by using letter designations from south to north. This complicates references to UTM. For example, standard offset could be used with or without the quadrangles (which affects the northing portion of the coordinate), non-offset doesn't use the quadrangles, and milgrid requires the quadrangles.

> More specifically, UTM coordinates define two dimensional, horizontal, positions. UTM zone numbers designate 6 degree longitudinal strips extending from 80 degrees South latitude to 84 degrees North latitude. UTM zone characters designate 8 degree zones extending north and south from the equator. There are special UTM zones between 0 degrees and 36 degrees longitude above 72 degrees latitude and a special zone 32 between 56 degrees and 64 degrees north latitude.

The Stealth uses the following definition:

A non-cartesian coordinate system in which the X, Y, and Z correspond to easting (nearly east), northing (nearly north), and height above an ellipsoid that approximates the surface of the earth. When in UTM mode (the default), the Stealth uses an offset UTM coordinate system, one in which coordinates are expressed with respect to an origin located at the latitude and longitude specified in a configuration file. Typically, this will be the location of the origin of your terrain database.

D.2. Arbitrary Offset UTM

MÄK products usually use the arbitrary offset UTM.

Arbitrary offset UTM does not use the zone directly and does not use the quadrangles at all. The origin is specified via any latitude/longitude position. Internally, calculations are performed with respect to the non-offset UTM origin of the zone and then expressed as locations with respect to the arbitrary offset origin. In other words, locations are offsets from the arbitrary origin. The non-offset UTM or standard offset UTM location could be determined by calculating the arbitrary offset origin in these systems (i.e. its zone, etc.) and adding on the arbitrary offset location. This system is almost always used for database generation because it allows greater precision since the offsets from the origin are typically smaller than from a standard or non-offset origin.

D.3. Standard Offset UTM

The standard offset UTM removes all negative coordinates. It is similar to non-offset UTM in that the northing portion of the origin is at the equator. It differs in that the easting portion of the origin is actually 500K meters west of the central meridian, i.e. outside of the longitudinal strip. South of the equator, 10M meters are added, so a quadrangle letter designator is sometimes necessary to distinguish north and south. Numbers increase to the north and east.

D.4. Non-Offset UTM

The origin of the zone is at the central meridian (in the middle of the longitude strip) at the equator, i.e there are -+3 degrees longitude within the zone to either side of the origin.

D.5. USGS or Civilian Mapping UTM

The USGS or civilian mapping UTM is essentially a non-quadrangle standard offset UTM. It only uses a zone number and an x and y coordinate to define a point and the ellipsoid and hemisphere are known or understood. This system could not be used to describe points in both hemispheres.

D.6. Milgrid UTM

This is essentially a standard offset UTM which uses the quadrangles (quadrangle letter designator is needed) and in addition, further subdivides the quadrangles into grid squares 100K meters on a side which are designated by double letters.

D.7. ModSAF UTM

ModSAF UTM appears to be a modified USGS civilian mapping UTM. The modification is that ModSAF reintroduces negative numbers to describe coordinates in the southern hemisphere.

Glossary

For additional terms and definitions, see the HLA glossary at: http://hla.dmso.mil/hla/general/hlagloss.html

absolute dead reckoning

A method of dead reckoning in which the Stealth uses the time stamps contained within state updates if the sender is using absolute time stamping. Contrast with relative dead reckoning.

aggregate

The combination of individual entities, aggregates, or both into a singular entity. For example, an organizational group such as a platoon.

articulated part

A part of an entity that is capable of movement relative to the entity, such as a turret or gun.

body coordinate frame

A coordinate framework centered on an entity. When the eyepoint moves with respect to an entity, we describe it as movement in a body coordinate frame.

channel

A channel is a particular view when you are displaying multiple views of a simulation.

clipping

A feature that prevents the display of terrain and objects or parts of objects, that are closer than or farther from specific distances from the eyepoint.

clipping planes

The range of distances from the eyepoint (near clipping and far clipping) in which the Stealth clips objects.

culling

The process of discarding database objects which are not within view, and therefore need not be rendered and displayed.

dead reckoning

A process by which the Stealth calculates the expected location of an entity during periods in which it does not receive state updates.

Defense Modeling and Simulation Office

The executive secretariat for the Executive Council on Modeling and Simulation (EXCIMS), which provides a full-time focal point for information concerning Department of Defense modeling and simulation (M&S) activities. Currently the DMSO promulgates M&S policy, initiatives, and guidance to promote cooperation among DoD components to maximize efficiency and effectiveness.

DIS

Distributed Interactive Simulation.

Distributed Interactive Simulation

The DIS protocol is a set of standards that govern how participating applications share information about the virtual world. The protocol specifies a set of packets, called protocol data units (PDUs), that communicate this information. Each PDU identifies the sender and contains other information depending on the PDU type. The DIS protocol also specifies when and how frequently PDUs are sent.

The DIS protocol has been superseded by the High-Level Architecture protocol for use by the Department of Defense.

DMSO

Defense Modeling and Simulation Office.

entity

An element in a simulation, such as a vehicle or a person, that is represented in the simulation through the issuance of state messages.

entity-type

A list of seven components as specified by the DIS protocol and HLA RPR FOM. If none of the seven components contains a wildcard (-1) value, then the entity type refers to a specific, narrowly-defined entity. If some components contain a wildcard, then the entity type refers to a class of entities. A larger number of wildcards indicates a broader, more general class.

The components of an entity-type are:

- Entity kind
- Domain
- Country
- Category
- Subcategory
- Specific
- Extra

Euler angles

A set of three angles used to describe the orientation of an entity as a set of three successive rotations about three different orthogonal axes (x, y, and z). These angles specify successive rotations needed to transform from the world coordinate system to the entity coordinate system.

exercise

The DIS term for a one or more interacting simulation applications. Compare to federation execution in HLA.

exercise ID

A numeric identification for a DIS simulation exercise.

FED file

Federation Execution Data file. The Federation Execution Data is the subset of FOM data needed and read by the RTI. VR-Link also reads the FED file.

federate

A connection to the RTI. Typically a single simulation application can be thought of as a federate.

federation

A group of HLA federates capable of playing in the same federation execution.

Federation Object Model

Defines the data content of a federation execution.

federation execution

The federation execution represents the actual operation, over time, of a subset of the federates and the RTI initialization data taken from a particular federation. It is the step where the executable code is run to conduct the exercise and produce the data for the measures of effectiveness for the federation execution. A federation execution is the logical equivalent of a DIS simulation exercise.

field of view

Field of view controls the perspective of the eyepoint.

A wide field of view creates an effect like that of a wide-angle camera lens. Objects appear smaller and farther away from the eyepoint, since the eyepoint coverage spans a wider area. Depth distances between objects become exaggerated.

A narrow field of view creates an effect like that of a telephoto lens. Objects appear larger and closer to the eyepoint, and the overall scene depth appears flattened. The distances between objects appears compressed.

filter range

A setting that prevents distant entities from being processed while allowing distant terrain to appear normally.

FOM

Federation Object Model.

frame rate

The rate at which the Stealth displays updated images.

ground clamping

A process by which the Stealth keeps an entity anchored to the surface of its terrain database, regardless of the altitude data contained in its entity state message.

guise

An alternative entity type used to display an object depending on the force ID. For example, a tank could look like an M1A1 to friendly forces and a T72 to hostile forces.

heads-up display

A set of indicators and readouts superimposed onto the Stealth graphics display. It displays the state of the eyepoint and the locations of other entities. Also called the overlay.

High-Level Architecture

The High Level Architecture (HLA) for simulations is a DOD-wide initiative to provide an architecture to support interoperability and reuse of simulations. The HLA supersedes DIS for the Department of Defense.

HLA

High-Level Architecture.

interaction

A message describing a simulation event. An HLA interaction describes an event, it does not update an object's state.

MÄK Technologies Lisp

An adaptation of the Lisp language used in configuration files for MÄK Technologies products.

message

A general term used to refer to DIS PDUs and HLA interactions and state updates.

MTL

MÄK Technologies Lisp.

orientation clamping

Adjusts the pitch and roll of an entity so that it appears properly seated when the terrain is inclined. For example, if a tank is moving horizontally across the face of a hill, orientation clamping prevents the tank from appearing level, and therefore, partially embedded into the hillside. Used with ground clamping.

PDU

Protocol Data Unit.

pipe

A Performer software object that is involved in processing and displaying a view.

Protocol Data Unit

A unit of data that is passed on a network between DIS simulation applications.

Realtime Platform Reference FOM

An HLA reference FOM based on the DIS protocol.

reference FOM

A FOM designed to be used as a whole, or with modification, by a wide variety of federation executions.

relative dead reckoning

A method of dead reckoning in which the Stealth approximates the location of an object based on the local time of receipt of the last state update message.

RTI Initialization Data (RID)

The initialization data required by the RTI for operation.

RPR FOM

Realtime Platform Reference FOM.

RTI

Run-Time Infrastructure.

Run-Time Infrastructure

A library and other supporting software that implements the HLA interface specification. All federates communicate with one another in an HLA environment through RTI functions.

smooth period

The period of time over which trajectory smoothing takes place, set to one second by default.

state

The current status of an object, including location, direction of movement, extent of damage, and so on.

terrain following

Causes the eyepoint to maintain a constant distance above the terrain surface. The eyepoint's height changes in tandem with the peaks and valleys as it passes over the geography.

timeout

The period of time in which the Stealth continues to display an entity after that entity's update messages have stopped appearing on the network. Timeouts are usually not used in HLA because there is no set frequency (no heartbeat) for transmitting messages.

topographic coordinate frame

A coordinate frame in the context of the terrain. When the eyepoint moves with respect to the terrain, we describe it as movement in a topographic coordinate frame.

trajectory smoothing

A method used by the Stealth to smooth positional discontinuities that could occur when new state updates arrive.

UDP port

A network channel through which the Stealth sends and receives data for DIS exercises.

Universal Transverse Mercator

In general, a non-cartesian coordinate system in which the X, Y, and Z correspond to easting (nearly east), northing (nearly north), and height above an ellipsoid that approximates the surface of the earth. When in UTM mode (the default), the MÄK Stealth uses an offset UTM coordinate system, one in which coordinates are expressed with respect to an origin located at the latitude and longitude specified in a configuration file. Typically, this will be the location of the origin of your terrain database. For more information, see Appendix D, *The UTM Coordinate System*.

UTM coordinates

Universal Transverse Mercator coordinates.

view control messages

A set of programmatic messages that let you control the Stealth remotely.

view floor

A minimum height above the terrain in Absolute or Track mode, below which the eyepoint is not allowed to go. The view floor is measured relative to the terrain surface.

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MÄK Stealth View-Modes Quick Reference

View-Mode	Entities	Description
Absolute	0	Free-fly mode. Eyepoint position and orientation are controlled manually.
Track	1	Lets you track an entity from a desired location. Position is set manually; orientation is controlled by the entity being tracked.
Tether	1	Eyepoint moves in tandem with the attached entity, keeping a constant distance from the entity, in a constant direction.
Compass	1	Position and heading are dependent on the attached entity. The controls move the eyepoint along the surface of a sphere centered at the attached entity. You control the eyepoint's longitude and latitude on the sphere, and its distance from the entity. The Stealth adjusts orientation automatically to keep the entity in view.
Mimic	1	Creates the effect of being inside the entity, or rigidly connected to it. Eyepoint position and orientation are both slaved to the entity.
Orbit	1	Position and heading are dependent on the attached entity. The eyepoint continually orbits along the surface of a sphere centered at the attached entity. You control the eyepoint's orbit speed, latitude, and distance from the entity. The Stealth adjusts orientation automatically to keep the entity in view.
Turret	1	Same as Mimic mode, but the eyepoint is slaved to the attached entity's first articulated part, rather than to the entity as a whole.
Tether Track	2	Monitors the activities of a pair of entities. The eyepoint points along a ray that connects the two entities, so that both entities can remain in view.
Mimic Track	2	Creates the effect of sitting in one entity while tracking another.
Group	1 or more	Shows all entities in a user-defined view-group. You can view the group from any direction.
Wide Group	1 or more	Shows all entities in a user-defined view-group. The eyepoint is positioned broadside to the group, so the entities are distributed as widely as possible across the field of view.

Keys for Selecting View-Modes

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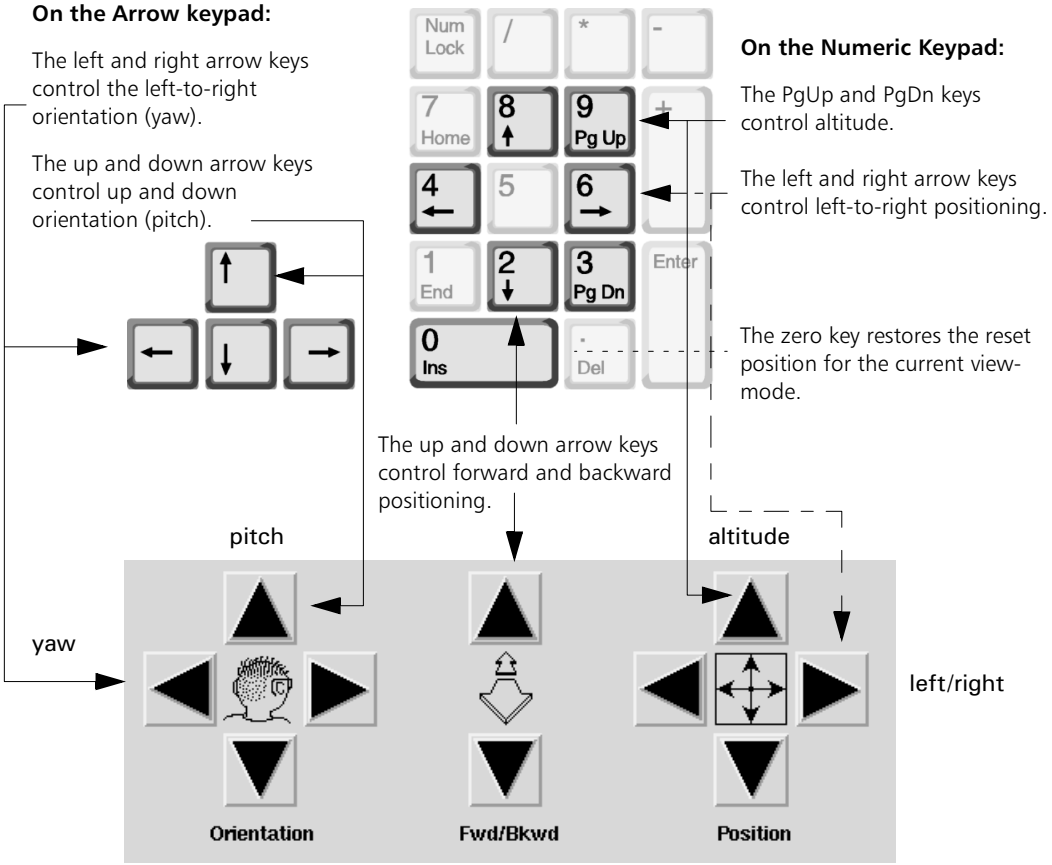
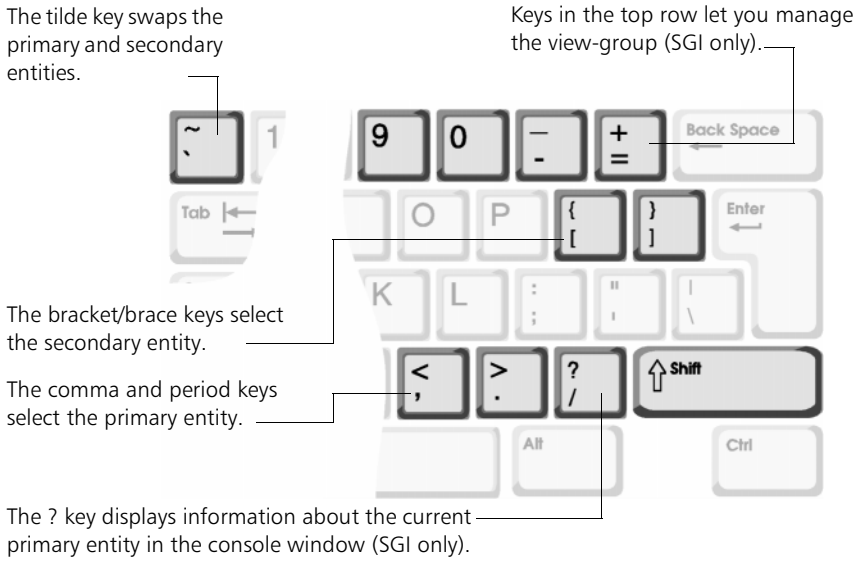
MÄK Stealth Controls Quick Reference



Attaching the Stealth to Entities and Aggregates (SGI) from the Keyboard



MÄK Stealth Keyboard Shortcuts

Key	Function	Key	Function
a	Decrease aggregate Highest Level one level. (SGI)	. (period)	Attach next entity (scroll entity list forward).
A	Toggle aggregate Altitude Control on or off. (SGI)	, (comma)	Attach previous entity (scroll entity list in reverse order).
b, B	Orbit mode	>	Attach next air vehicle.
c, C	Compass mode	<	Attach previous air vehicle.
d	Toggle terrain following on or off.	]	Track next entity in list.
e	Toggle display of EM emissions on or off. (SGI)	[	Track previous entity in list.
f	Toggle view floor limit.	}	Track next air vehicle.
F	Scroll through cull modes. (SGI)	{	Track previous air vehicle.
g	Toggle ground clamping	~	Swap primary and secondary entities.
K	Toggle backface processing on or off (SGI).	F1	Toggle video pass through in single monitor mode. (PC)
l, L	Toggle lighting on/off	F3	Save view states to file.
m	Turret mode.	F4	Toggle overlay on/off
n	Group mode	F5	Toggle recording on/off
N	Wide group mode	F9	Iconify and pause application
o	Return to start position in absolute mode. (SGI)	Shift/1-8 (keyboard)	Save view state to number selected.
O	Save current eyepoint as start position. (SGI)	1-8 (keyboard)	Recall numbered view state.
P	Scroll through the frame control modes. (SGI)	+	Add primary entity to view group. (SGI)
q	Raise aggregate Highest Level one level. (SGI)	-	Remove primary entity from view group. (SGI)
Q	Toggle nested aggregates on or off. (SGI)	9 (keyboard)	Add all entities to view group. (SGI)
r	Decrease frame rate. (SGI)	(	Add air vehicles to view group. (SGI)
R	Increase frame rate. (SGI)	0 (keyboard)	Remove all entities from view group. (SGI)
s	Toggle statistics display on or off. (SGI)	LEFT	Rotate left in current view mode
S	Send text version of statistics to console. (SGI)	RIGHT	Rotate right in current view mode
t, T	Toggle texture on/off	UP	Rotate up in current view mode
v	Mimic mode	DOWN	Rotate down in current view mode
V	Mimic track mode	NUMPAD 0	Return to original position in absolute mode
w	Toggle filled and wireframe modes. (SGI)	NUMPAD 1	Decrease the increment value
w, W	Toggle polygon mode on/off (OpenGL only)	NUMPAD 2	Move camera back in current view mode
x	Tether mode	NUMPAD 3	Move camera down in current view mode
X	Tether track mode	NUMPAD 4	Move camera left in current view mode
z	Absolute mode	NUMPAD 6	Move camera right in current view mode
Z	Track mode	NUMPAD 7	Increase the increment value
Escape	Quit	NUMPAD 8	Move camera forward in current view mode
?	Display information about primary entity. (SGI)	NUMPAD 9	Move camera up in current view mode

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MÄK Stealth Startup Options Quick Reference (excludes Performer options)

Option	Description	Option	Description
`-A` *addr*	DIS: Sets the destination address for outgoing PDUs.	`-m` *mode*	SGI: Specifies how application, cull, and draw processes are distributed among multiple processors.
`-b`	Causes the Stealth to send state updates onto the network.	`-P` *port*	DIS only: Specifies the UDP port the Stealth uses.
`-c` *num*	SGI: Sets the number of channels, up to 3.	`-r` *rate*	SGI: Specifies target frame *rate* in Hertz.
`-C` *p1,p2[,p3]*	SGI: Assigns specific pipes to channels.	`-s` *scale*	SGI: Set the initial LOD scale factor.
`-D`	SGI: Lock down Draw process (only) to a specific processor.	`-S` *mcast-addr*	DIS only: Subscribes the Stealth to the specified multicast address.
`-d` *hostname*:*0*	SGI: Selects the machine used to display the Stealth's windows.	`-T`	Prevents the loading of a terrain database, for quick startup.
`-E` *mode*	SGI: Specifies the initial Earth/Sky mode	`-v` *gap-angle*	SGI: For multiple monitors, sets the field-of-view gap between displays, in degrees.
`-G` *lat,lon,alt*	Sets initial eyepoint location to a specified geodetic position.	`-V` *num*	DIS only: Sets the DIS protocol version for PDUs sent onto the network.
`-i` *force-id*	Specifies the force ID contained in outgoing state messages.	`-W` *size*, or `-W` *width,hgt*	SGI: Sets the initial size of the graphics display, in pixels. Specify *size* for a square window, or a separate *width* and *height*.
`-I` *count*	SGI: Starts the Stealth, prints statistics for *count* frames, then exits.	`-x` *ExName* `-x` *ExNumber*	HLA: Sets the federation execution name. DIS: Sets the exercise ID.
`-j` *level*	Stealth notify level.	`-X`	SGI: Disable the exit confirmation prompt.
`-K`	SGI: Prevents the priority of Stealth processes from degrading.	`-z` *phase*	SGI: Sets the frame synchronization mode.
`-l` *mtl-file* `-l` *"mtl-command"* `-l` *parm=value*	Do any of the following at startup: load an *.mtl* file.; execute an MTL command; set a parameter.	`-Z`	SGI: Lock down Stealth processes to specific processors; don't free the processors first.
`-L`	SGI: Free up processors, then lock down application, cull, and draw processes to specific processors.		

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