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ADFStealthViewer User Manual

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DSTO-GD-0745

ABSTRACT

The ADFStealthViewer User Manual details how to install, configure and use the ADFStealthViewer software. The software is based on an open source simulation and gaming engine stealth viewer application. Stealth viewers enable users to view a simulation event as a passive 'stealth' observer. The stealth viewer displays simulation entities with a 3D model representation in a 3D virtual world. The software allows basic features such as the ability to fly anywhere and look anywhere; configure networks and maps; connect to and disconnect from a network; set user preferences; entity search and attach behaviours.

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ADFStealthViewer User Manual

Executive Summary

The ADFStealthViewer User Manual details how to install, configure and use the ADFStealthViewer software. The software is an Australian configured version of the StealthViewer that is built using the open source Delta3D simulation and gaming engine software. The Australian configuration involved obtaining 3D models of terrain and vehicles and configuring the applications files to make the application display correct models of simulated Australian entities during a wargame. The current version of the tool is a prototype with limited functionality and testing.

The manual describes how to install the software on a Windows XP machine and connect the application to a HLA or DIS simulated war game. There are also descriptions of common uses such as moving the camera, attaching to entities, using tools such as binoculars, setting the terrain to use, setting time of day, recording and playback.

The manual also describes how the entities being represented can be increased and how new models and terrain can be added to the tool environment.

The manual also describes how the tool was enhanced from the Delta3D tool to enable either HLA or DIS to be converted to KML which allows display in tools like Google Earth in either 2D or 3D.

The software and all models and terrain are available to anyone within the Australian Defence Organisation.

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Acronyms

3D	Three Dimensional
ADF	Australian Defence Force
ADO	Australian Defence Organisation
ADSO	Australian Defence Simulation Office
AEWC	Airborne Early Warning & Control
AGI	Advanced Geospatial Intelligence
AWD	Air Warfare Destroyer
BSD	Berkeley Software Distribution
CTDB	Compact Terrain Database
DIS	Distributed Interactive Simulation
DSTO	Defence Science and Technology Organisation
GPS	Global Positioning System
GUI	Graphical User Interface
HLA	High Level Architecture
IIS	Internet Information Services
IP	Internet Protocol
JSAF	Joint Semi-Automated Forces
KML	Keyhole Mark-up Language
MCC	Maritime Concepts and Capability
MOD	Maritime Operations Division
NASA	National Aeronautics and Space Administration
NSW	New South Wales
NTDS	Naval Tactical Data System
OSG	Open Scene Graph
PNG	Papua New Guinea
RAN	Royal Australian Navy
RID	RTI Initialization Data
RPR	Real-Time Platform Reference
RTI	Real-Time Infrastructure
UI	User Interface

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1. Introduction

This is the user manual for the ADFStealthViewer software developed by members of the Maritime Concepts and Capability (MCC) Group of the DSTO Maritime Operations Division (MOD) in Sydney.

One of the principal tasks of the MCC group is support of the Royal Australian Navy's (RAN) HEADMARK experimentation activity. HEADMARK activities consist of workshops and war games which exploit the expertise of war-fighters and Subject Matter Experts (SME). The DSTO role is the design and facilitation of the activities and scientific analysis of the results. Part of the support provided is the development and application of appropriate modelling, simulation and analysis tools. HEADMARK is the main RAN experimentation activity supported, however a number of similar events are also conducted by the MCC and other groups at DSTO Sydney.

ADFStealthViewer is intended to enhance the simulation elements of RAN experimentation in particular the Joint Semi-Automated Forces (JSAF) tool by enabling a 3D visualization of the simulated wargame. A stealth viewer enables users to view a simulation event as a passive 'stealth' observer.

JSAF is described as the following from the FAQ documentation supplied with JSAF. "JSAF (Joint Semi-Automated Forces) evolved from the DARPA Synthetic Theater of War (STOW) Advanced Concept Technology Demonstration. STOW was developed to integrate and transition technologies necessary to demonstrate entity or platform level simulation in support of joint command and staff training, mission rehearsal and other DoD simulation requirements."

The intended users of the software are the analysts and the participants in simulation experiments. Using ADFStealthViewer will enable them to view the experiments from different perspectives. The recording capabilities also enable the analysts to analyse as well as playback the event at a later date.

2. ADFStealthViewer Software Overview

2.1 Software Origins

The ADFStealthViewer is a version of the Delta3D's SimCore StealthViewer tool tailored for Australian entities. The tool is described on the project website¹ as follows:

"The SimCore also includes the Stealth Viewer. This tool is a functionally complete instructor operator station that allows users to view a simulation event as a passive 'stealth' observer. It includes basic commodity features such as the ability to fly anywhere & look anywhere;

¹ The project information can be found under the projects page on the following website <http://www.delta3d.org>.

configuring networks and maps; connecting to and disconnecting from a network; user preferences; entity search and attach behaviours²; and basic tools such as the binoculars and compass. It also provides the ability to record an entire scenario and play it back viewed from anywhere, at any angle, from 1/10 to 16X real-time.”

2.2 Software Development Status

The current software is a prototype³. At this stage of development, comprehensive testing, documentation and a complete mapping of entities have not been completed. There is also functionality described on the delta3d.org website that has not been tested or investigated.

Further development of the software is described in section 18.

2.3 Software Implementation

The ADFStealthViewer has been implemented as a self extracting installer that installs a built (fully executable) version of the StealthViewer.

This version of ADFStealthViewer was compiled from source version of Delta3D version 2.5.0.

2.4 Terrain Data

The ADFStealthViewer includes a repository of ADF-sourced terrain of some areas of interest namely: Sydney, Umboi Island in PNG and the East Coast of Australia. There is also Compact Terrain Database (CTDB) correlated (built from the same source with same geospatial information) terrain for the terrain accompanied with the ADFStealthViewer.

Terrain was also produced under contract by BAE Systems Australia for the ADF in Open Flight and CTDB (used by the JSAF tool) formats. High resolution terrain of Sydney Harbour⁴ and Umboi Island⁵ in PNG is included, as well as a lower resolution terrain of the East Coast of Australia.

The data is located in the ADFStealthViewer\data\ProjectAssets\terrains directory and JSAF terrain in a ctdb_8.7 directory.

The tool has been configured by modifying mapping files to allow simulated entities of most Australian assets and some Kamarian⁶ assets to be represented by a 3D model of that entity in ADFStealthViewer.

² Behaviours like attaching to an entity and moving a set distance and orientation away from the entity.

³ Nominally version 1.1.

⁴ The latitude and Longitude used for Sydney Harbour is 33°51'6.17"S, 151°11'47.92"E

⁵ The latitude and Longitude used for Umboi Island 5°37'10.78"S, 147°57'42.17"E

⁶ KAMARIA is a fictitious adversary country that has been developed over a number of years to support wargaming and simulation of warfare.

2.5 3D Model Data

Wikipedia describes 3D Models as being used to : “ represent a 3D object using a collection of points in 3D space, connected by various geometric entities such as triangles, lines, curved surfaces” [http://en.wikipedia.org/wiki/3D_modeling]. In ADFStealthviewer 3D Models of military platforms, people and environmental objects are used to immerse the user in a 3D visualisation of the simulated war game.

ADFStealthViewer has several ADF produced 3D models. This is not a complete repository and many models need to be created, updated or modified. The models are all either ADF owned or open source. To view the models a tool shipped with the ADFStealthViewer, called ObjectViewer.exe, can be used.

The 3D model data is located in:

`\ADFStealthViewer\data\ProjectAssets\StaticMeshes\ADFModelRepository` directory⁷.

3. Installing and Launching ADFStealthViewer

3.1 Installation

The following quoted paragraphs describe the hardware requirements as specified on the delta3D website.

“Currently, Delta3D is developed and tested using medium-to-high performance hardware. The basic functionality of the engine should work as expected on the majority of hardware, provided the hardware has OpenGL, audio, and networking devices.

Some advanced functionality of the engine relies on modern graphics pixel and vertex shaders. These advanced features are not critical and support fall-back implementations should the hardware not support it.”

In addition ADFStealthViewer has been developed on the Windows XP operating system. ADFStealthviewer should run on Windows XP, Windows 7 and Windows 8 but has only been tested on Windows XP machines (64 and 32 bit).

The installer can be obtained from DSTO (see Appendix A for contact details).

⁷ Note anything in the vehicles directory is open source and distributed by Delta3D

3.2 Launch

To launch the ADFStealthViewer on Windows XP select “start > All Programs > DSTO > ADFStealthViewer >StealthQt.exe”

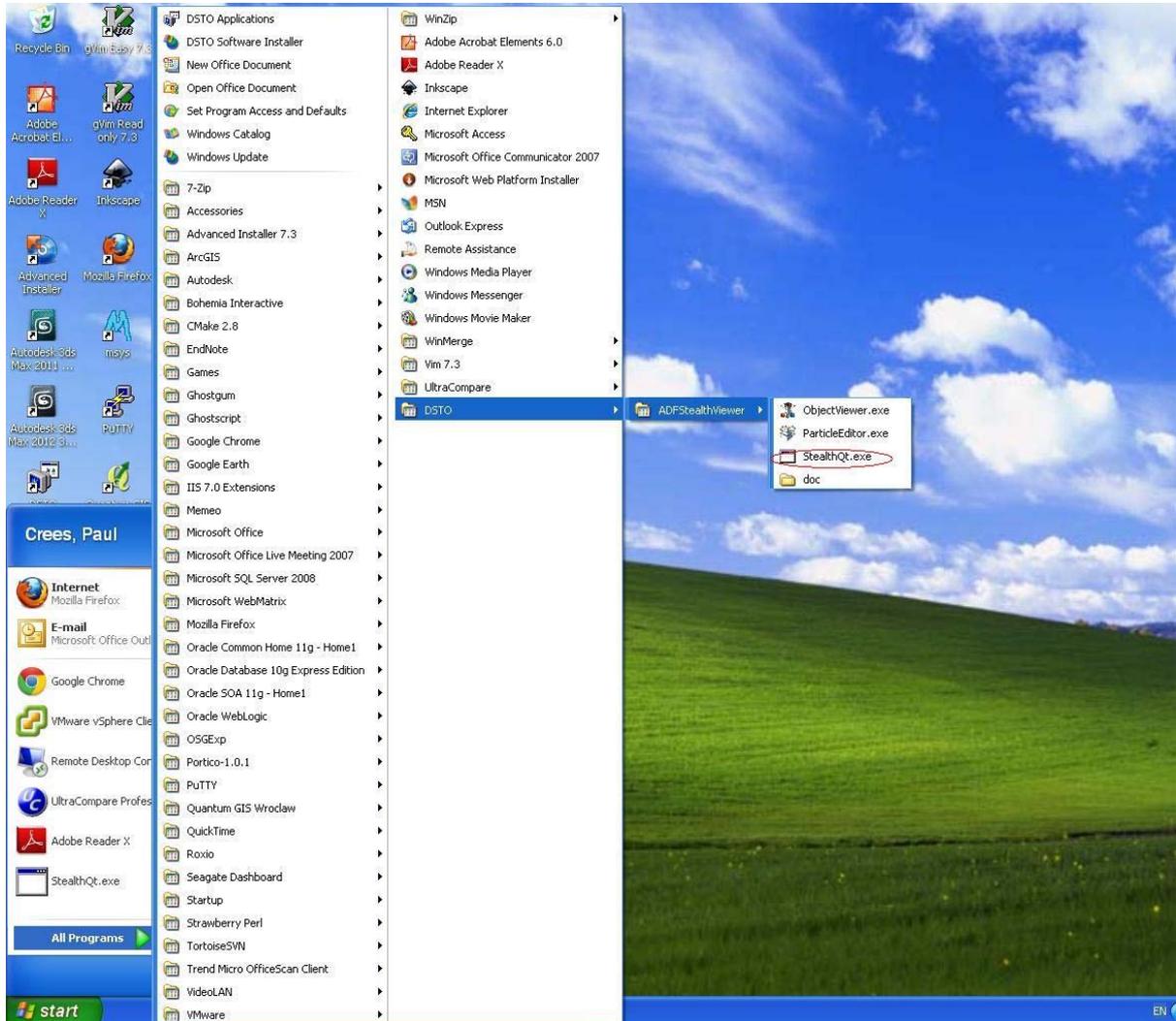


Figure 1 Launching ADFStealthViewer

If the launch has been successful the following Stealth Viewer screen will appear.

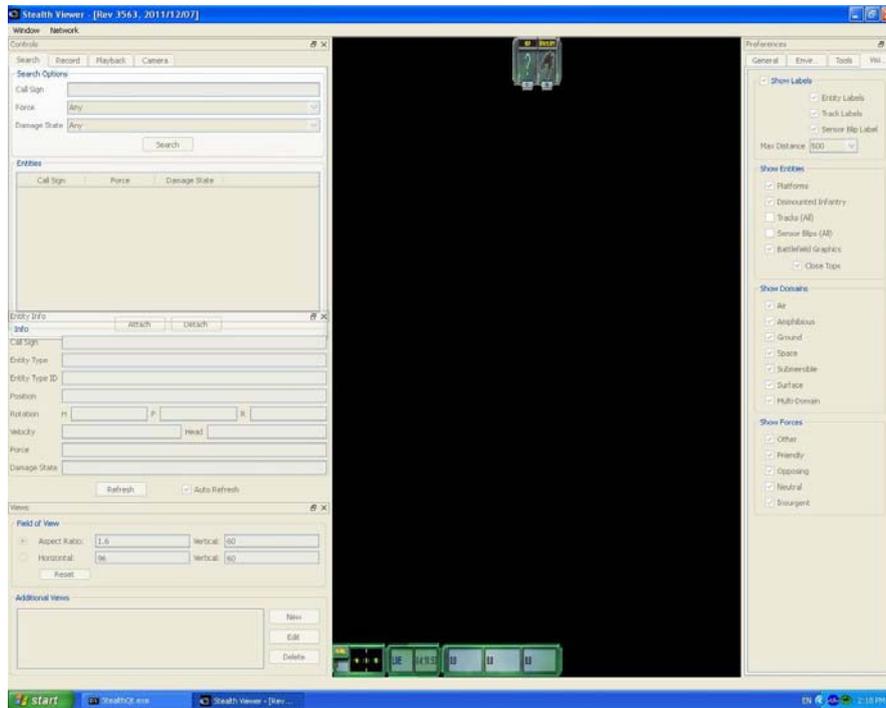


Figure 2 ADFStealthViewer GUI

A Graphical User Interface (GUI) window and a command window are launched when the ADFStealthViewer is launched. The command window contains information relevant to the status of a connection to a simulation as well as errors or warnings encountered when the simulation is running.

```

C:\Development\ADFStealthViewerBinaries\ADFStealthViewer_FinalBuild\bin\StealthQt.exe
[14:05:01 Warn] No property found for "<Actor: Effects.Detonation Actor, Center
of Gravity).>" ['BaseXMLHandler.cpp' dtCore::ActorPropertySerializer::Characters<
>]
[14:05:01 Warn] No property found for "<Actor: Effects.Detonation Actor, Center
of Gravity).>" ['BaseXMLHandler.cpp' dtCore::ActorPropertySerializer::Characters<
>]
[14:05:01 Warn] No property found for "<Actor: Effects.Detonation Actor, Center
of Gravity).>" ['BaseXMLHandler.cpp' dtCore::ActorPropertySerializer::Characters<
>]
-- RTI-s version D18C release -- HLA 1.3 C++ API -- Protocol 0xE2 --
Built on crees (winnt_vc++-unknown) at Mon Apr 27 14:50:30 2009 by CreesP
Telnet to port 2323 to access command line parser.
Using multicast uplink.
UDP Multicast running on default network device 131.185.105.115
  
```

Figure 3 ADFStealthViewer Command Window

4. Connecting to HLA Federations

High Level Architecture (HLA) is a simulation architecture that allows for distributed simulations. Using HLA a simulation can interact (communicate data, and synchronize actions) with other computer simulations connected to the same HLA federation.

To connect to a HLA-based simulation such as JSAF select “Network->Connection” to bring up the network connections dialog.

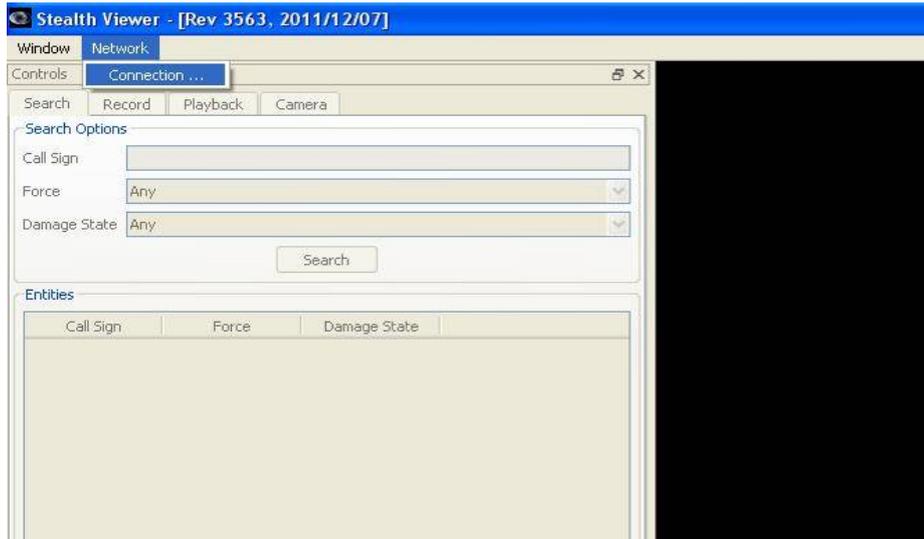


Figure 4 ADFStealthViewer Connecting to a simulation

In the Network Connections Dialog select New to create a new connection.

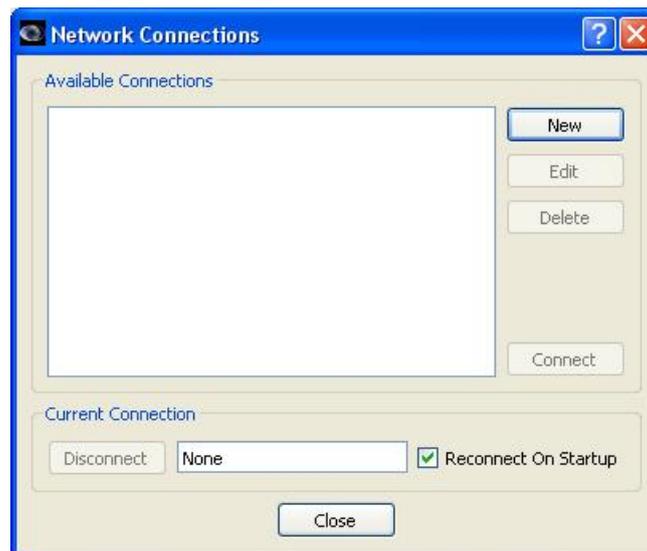


Figure 5 ADFStealthViewer Network Connections Dialog

If “Reconnect On Startup” is selected, deselect it unless the stealth viewer is always to launch this connection when it starts.

In the Network Options Select HLA.

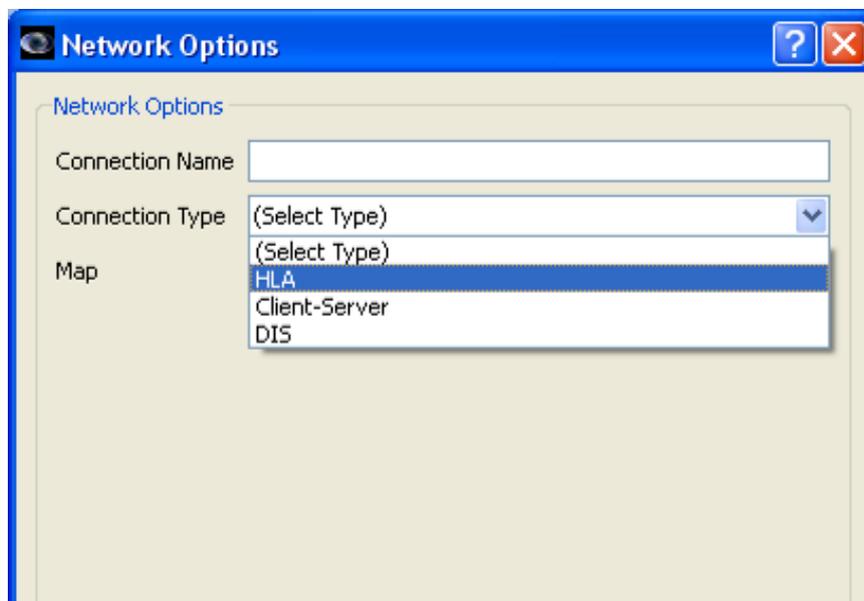


Figure 6 ADFStealthViewer Network Options Dialog

When HLA is selected further options appear as shown in Figure 7.

The network options should be completed with the following settings to test connectivity between the ADFStealthViewer and the simulations connected to the HLA federation rpr-1.0 with a federation execution name of rpr-1.0.

Connection Name:	rpr-1.0
Connection Type:	HLA
Map:	nsw_sample
Federation Execution Name:	rpr-1.0
Configuration Resource:	RPR1Mapping_AustralianStealthViewer
Federation Resource:	rpr-1.0.fed
Rid File:	RTI-s_1.3_D18C.rid

The Map, Configuration Resource, Federation Resource and RID file are set by pressing the button with 3 dots and selecting files through the file selection dialog. The map file is in the maps directory and the resource and RID file are located in the Federations directory.

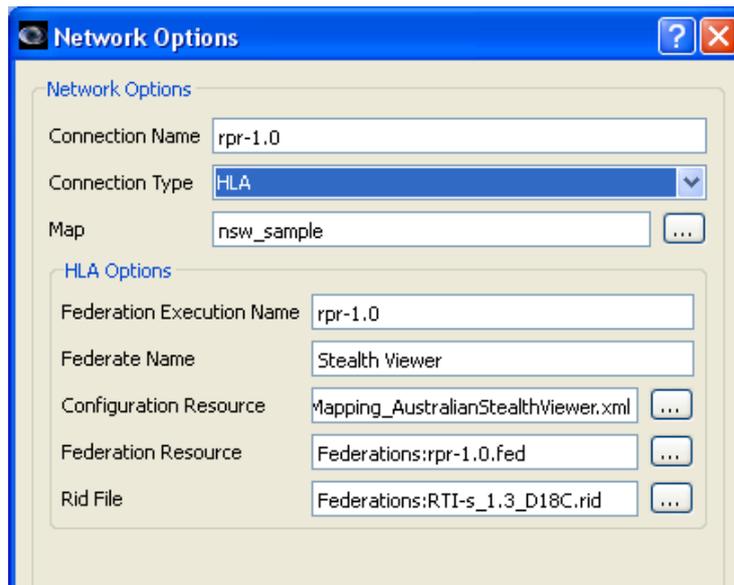


Figure 7 ADFStealthViewer Completed Network Options Dialog

Select OK at the bottom of the page (not shown) to save the new network connection.

Having created the connection, to connect to the rpr-1.0 HLA federation select rpr-1.0 in available connections and select connect.

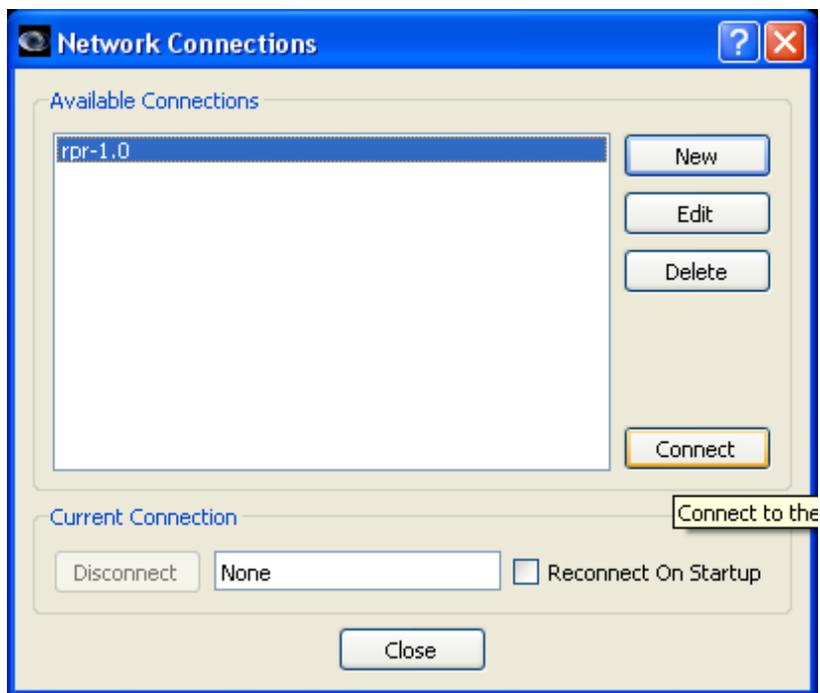
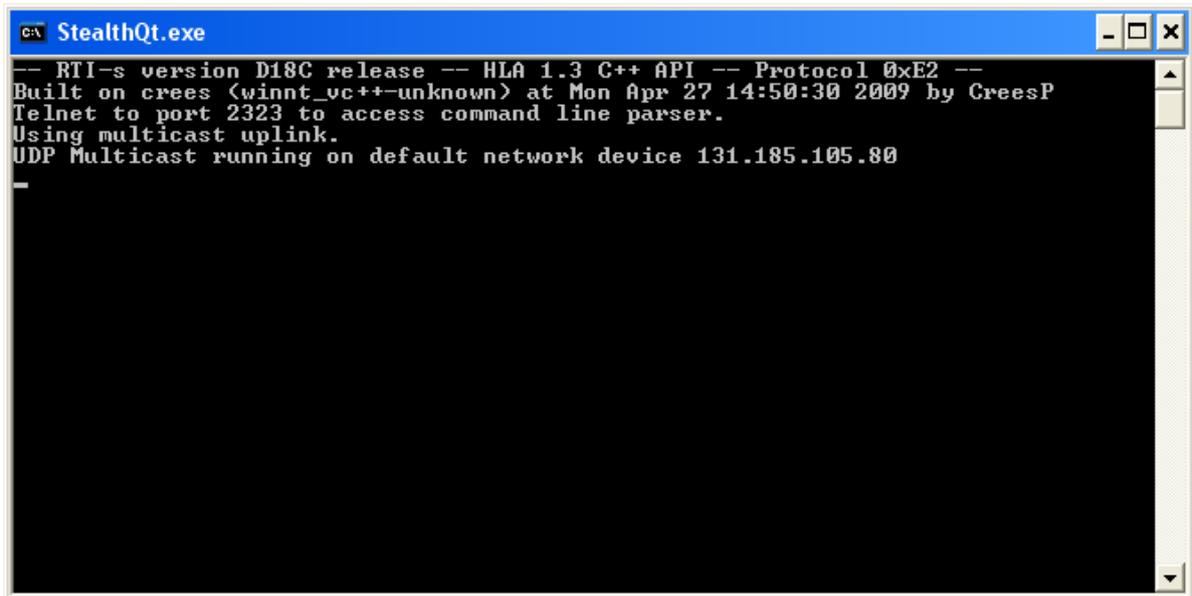


Figure 8 ADFStealthViewer Connect to Federation

The StealthQt.exe console window should show the RTI-s has connected.



```
C:\> StealthQt.exe
-- RTI-s version D18C release -- HLA 1.3 C++ API -- Protocol 0xE2 --
Built on crees (winnt_vc++-unknown) at Mon Apr 27 14:50:30 2009 by CreesP
Telnet to port 2323 to access command line parser.
Using multicast uplink.
UDP Multicast running on default network device 131.185.105.80
-
```

Figure 9 ADFStealthViewer Command Window Connecting to Federation

The ADFStealthViewer will display a small patch of terrain in NSW. The rightmost pane shows a ground level view. The rest of the area is blank as this is a small piece of terrain placed on an invisible globe that has a computer generated atmosphere. If no terrain is present for an area on the earth and the ADFStealthViewer camera looks at it, it will be blank. Terrain pieces effectively become islands on this globe.

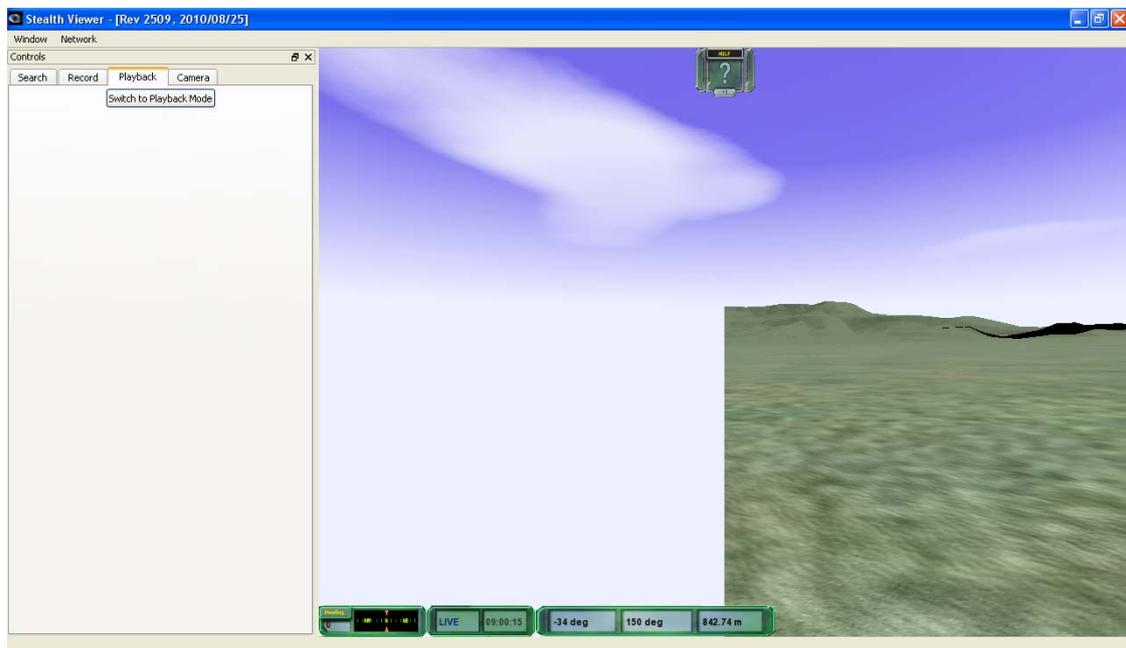


Figure 10 ADFStealthViewer NSW terrain

5. Moving the Camera

Basic movement is achieved by moving the mouse to determine the direction. Alternatively selecting the "W" key to moves the view forward, "S" backwards, "A" left and "D" right. The speed can be increased by clicking "+" key and decreased by selecting the "-" key.

Selecting "Camera" in the left panel shows the basic movement commands.

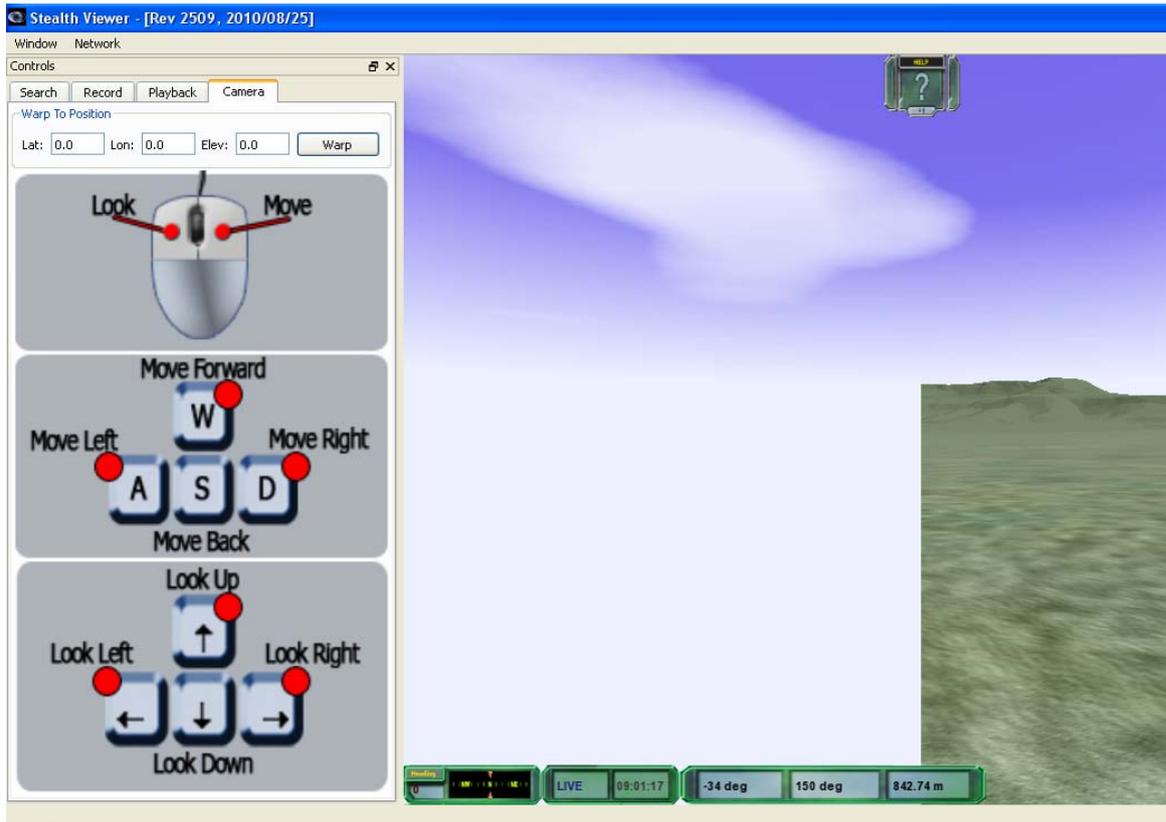


Figure 11 ADFStealthViewer Basic Camera Movement

6. Attaching to entities

In order to display entities, like tanks or aircraft, in ADFStealthViewer, from a simulation that communicates with it via HLA or a Distributed Interactive Simulation⁸ (DIS), the simulation needs to be run first to generate those entities. The entities generated can then be attached to in the ADFStealthViewer. The simulation used to demonstrate this is JSAF obtained from the Australian Defence Simulation Office (ADSO).

First run a JSAF session to connect to the same federation instance. In the case below the federation type is rpr-1.0 and the federation instance or fedex is rpr-1.0. The fedex can be different from the federation and there could be multiple federations running. For simulators to join a running HLA federation they must therefore have the same federation and fedex assigned.

The command used to launch JSAF was:

```
cd /jsaf_local/JSAF_ADSO/src/JSAF
./jsaf -tdbpath /terrain -terrain world_thin_fmt8_7_180W180E75S75N_v01 -federation rpr-1.0 -fedex rpr-1.0
```

In Figure 12 an Australia M1A1 AIM-D tank was added in JSAF at around Latitude 34S and Longitude 150E using the JSAF tools "Create Units" editor.

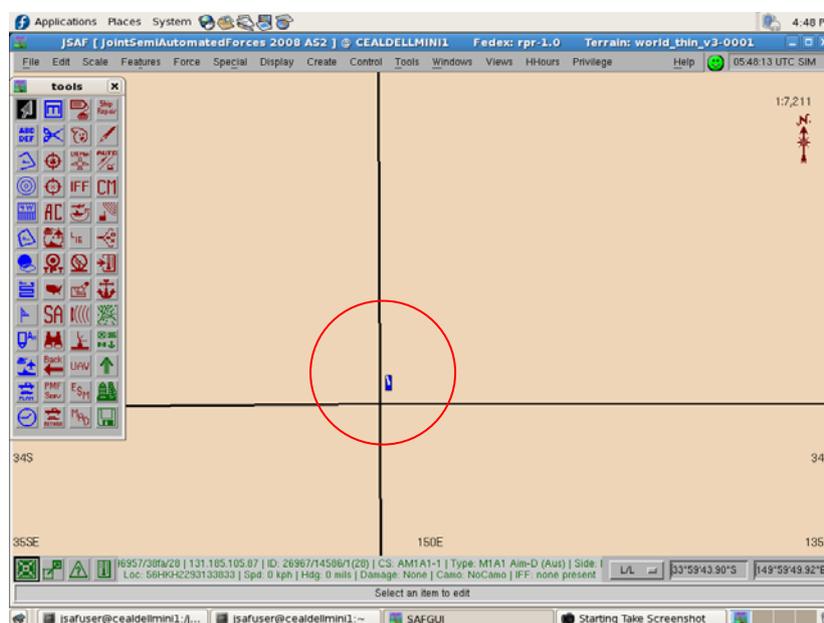


Figure 12 Tank added in JSAF

The entity will then appear in the Stealth Viewer if you are looking at the correct position.

⁸ An distributed simulation standard preceding HLA

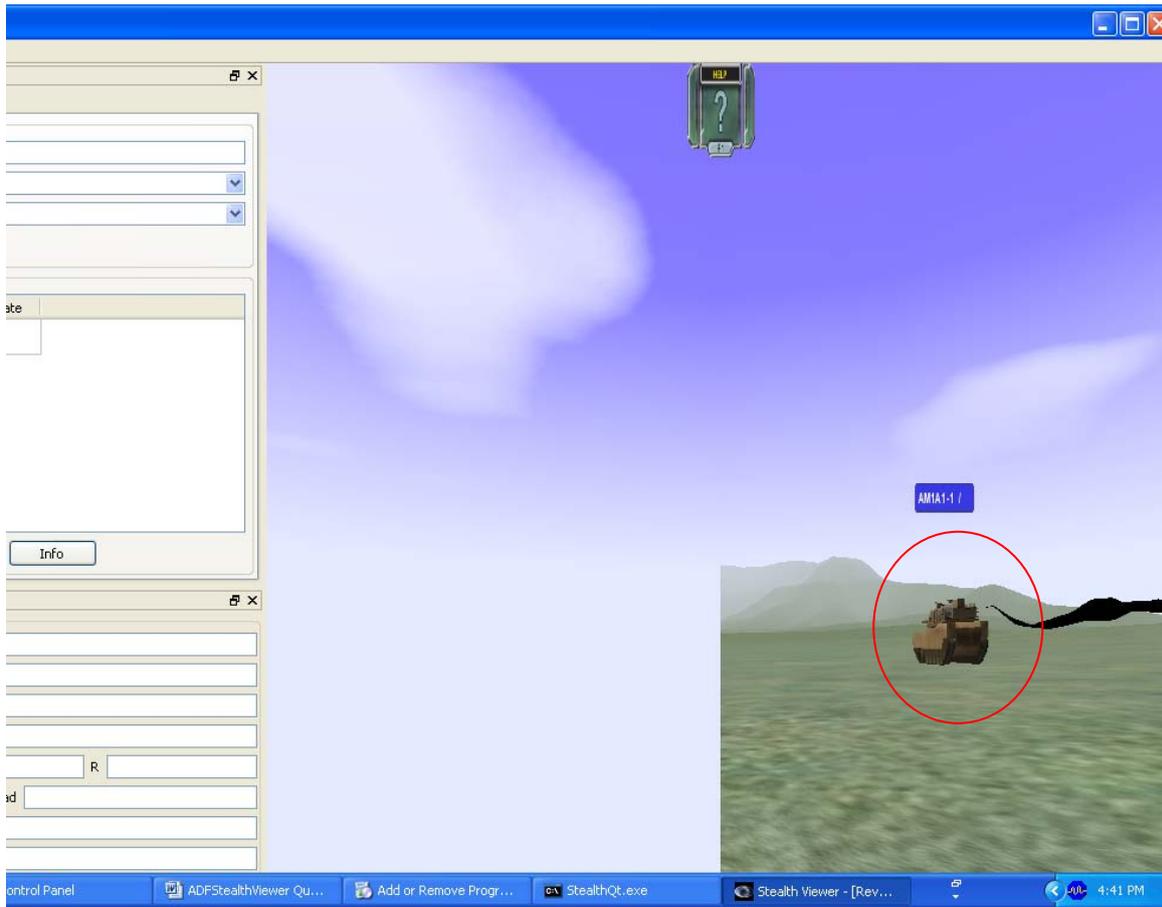


Figure 13 JSAF Entity displayed in ADFStealthViewer

To attach to an entity select the Search tab on the controls window and select the search button.

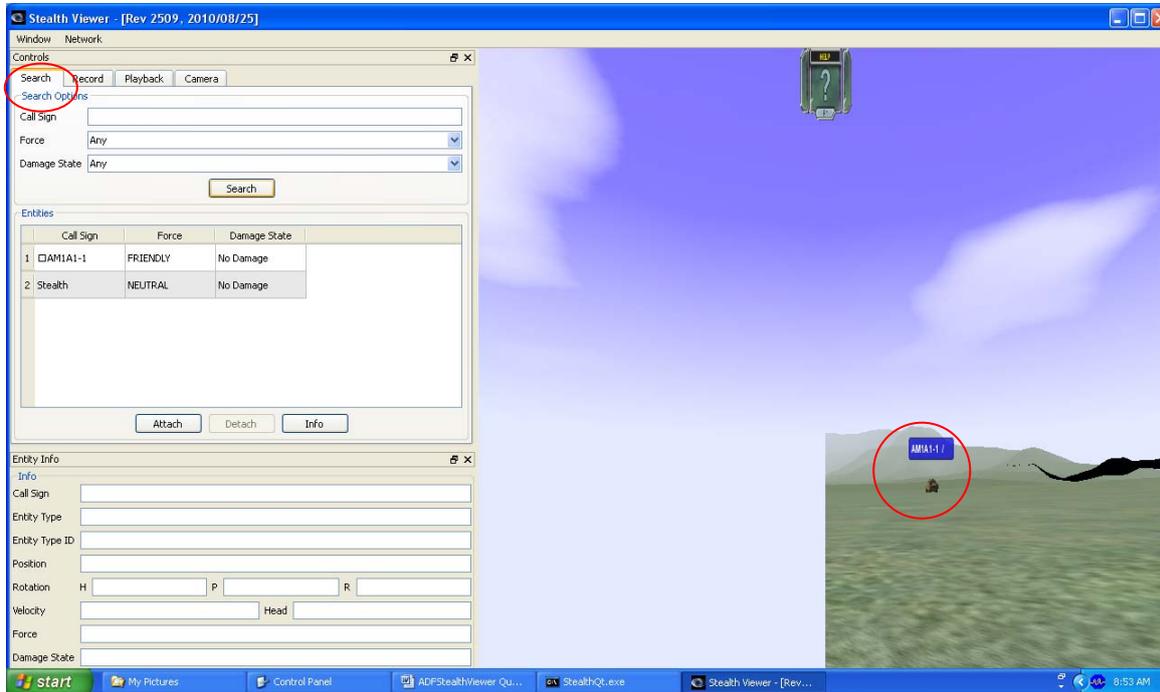


Figure 14 Selecting an Entity to Attach

Select the entity you want to attach to in the Entities list and select attach. You may need to move around the mouse or close some of the other windows to select the attach button.

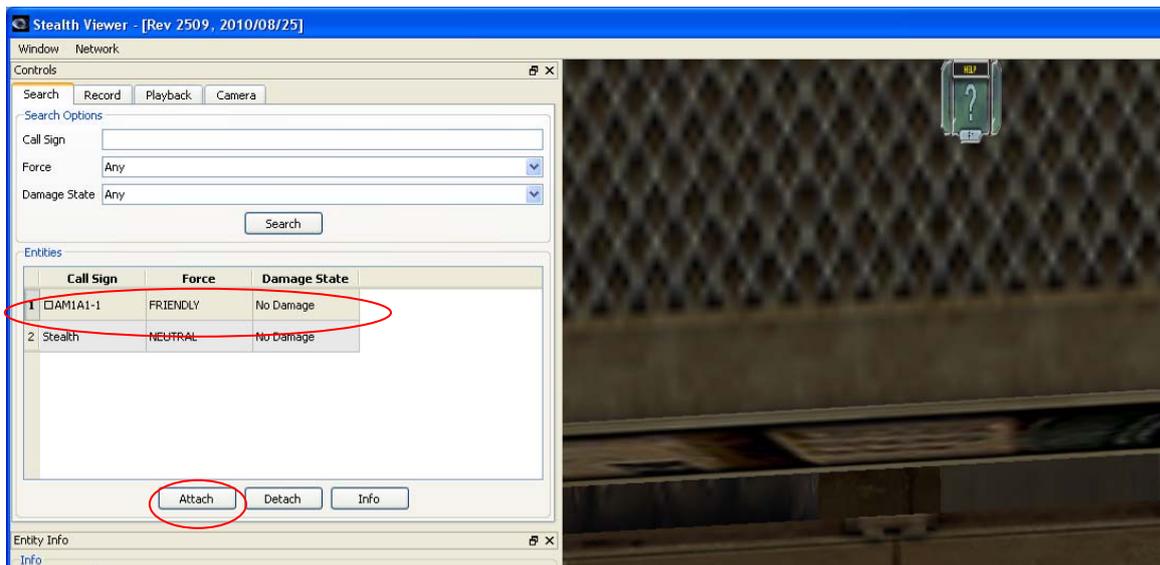


Figure 15 Attaching to the Tank

In Figure 15 the tank is seen in extreme close-up. Once attached to an entity the camera can be moved from the entity to a set distance and angle; this allows the entity to be seen properly.

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This is achieved by zooming in and out and moving the mouse. The camera remains tethered at that relative position until it is detached in the same search tab or moved using the mouse and/or zoom keys.

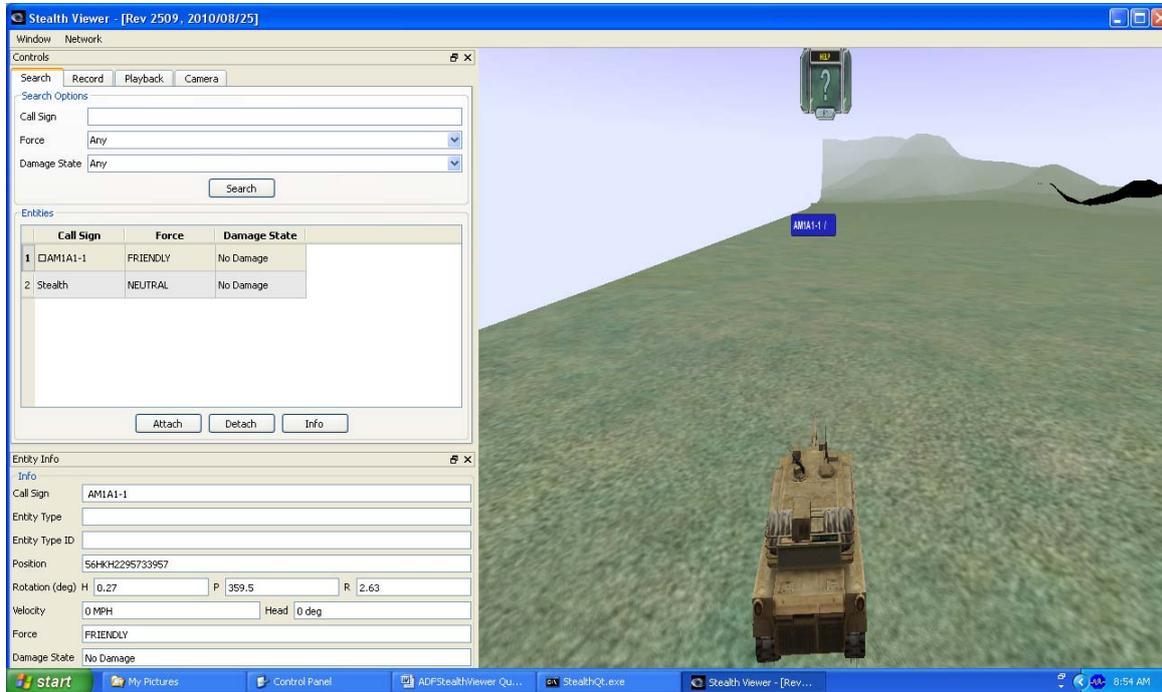


Figure 16 Tethering Camera away from Entity

In a more complex scenario the Search will show multiple entities that can be attached to.

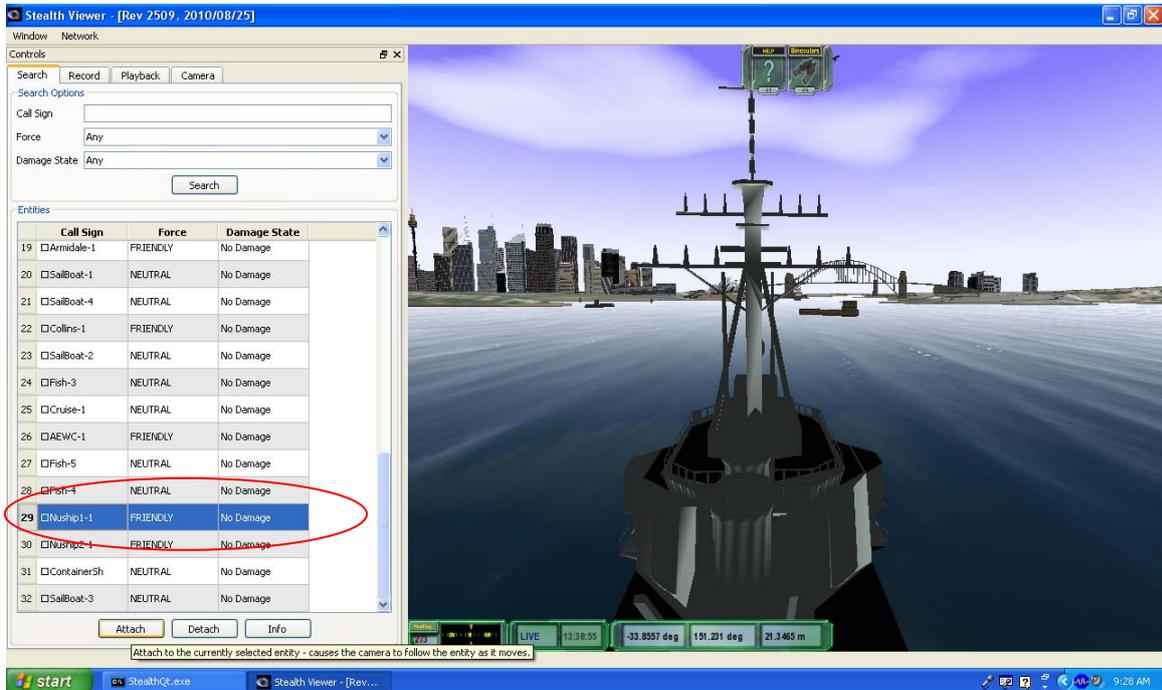


Figure 17 Attaching to an AWD

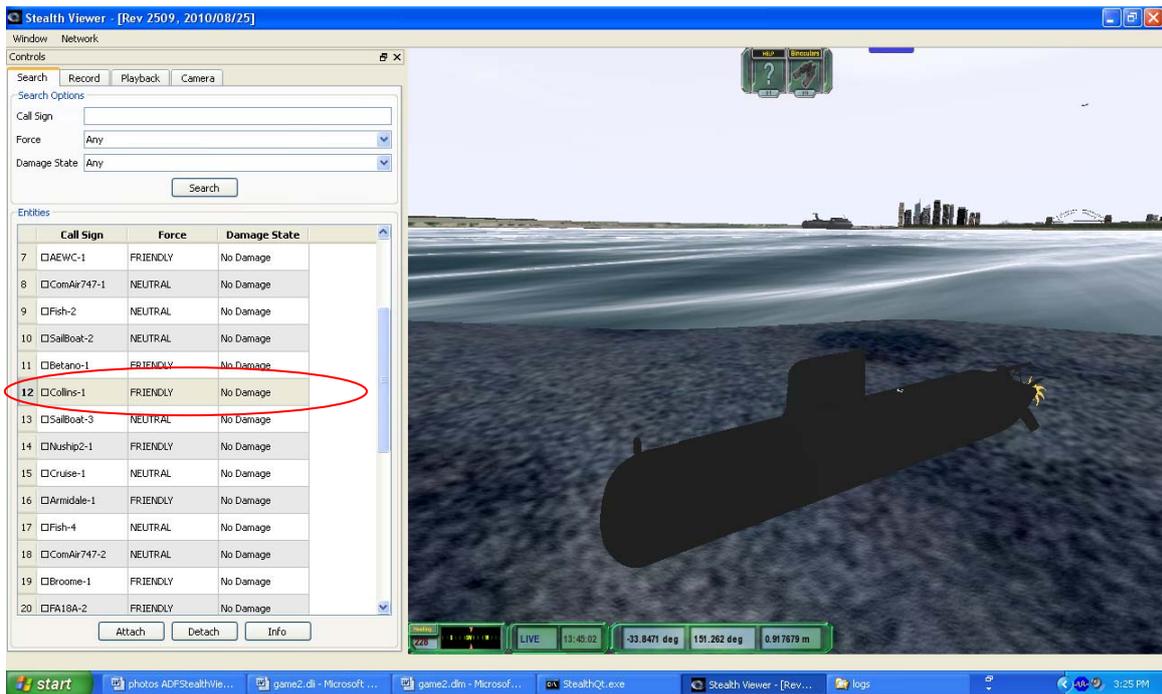


Figure 18 Attaching to a submarine

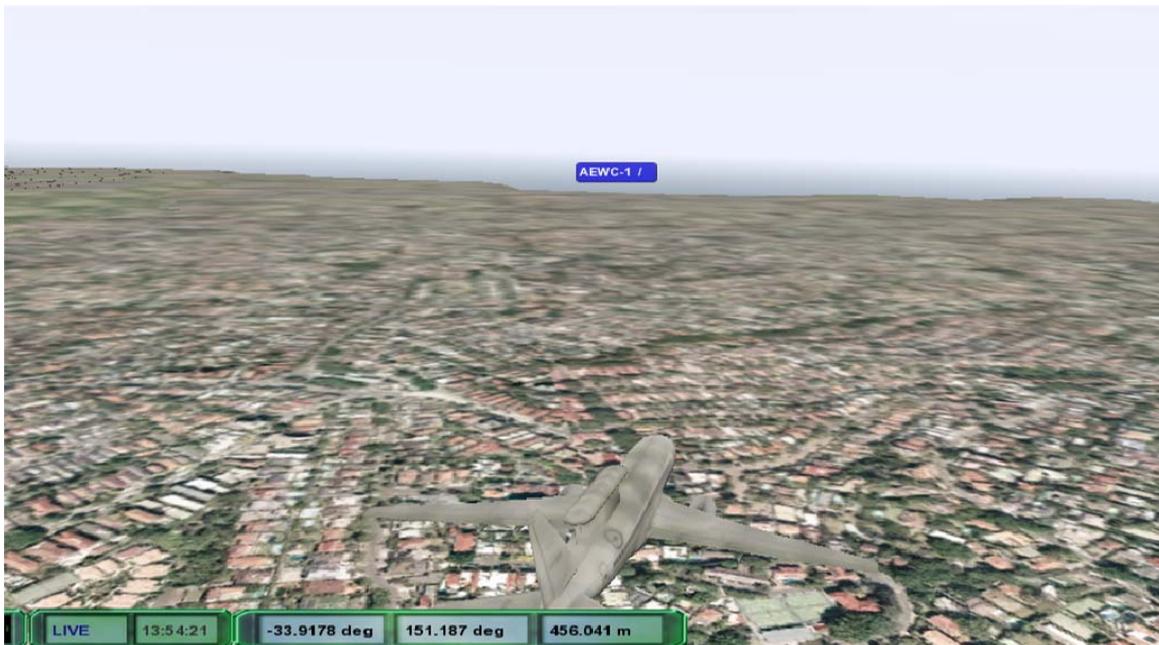


Figure 19 Attached to an AEW-1

The Entity Info dialog in the left pane shows some information about the currently attached entity.

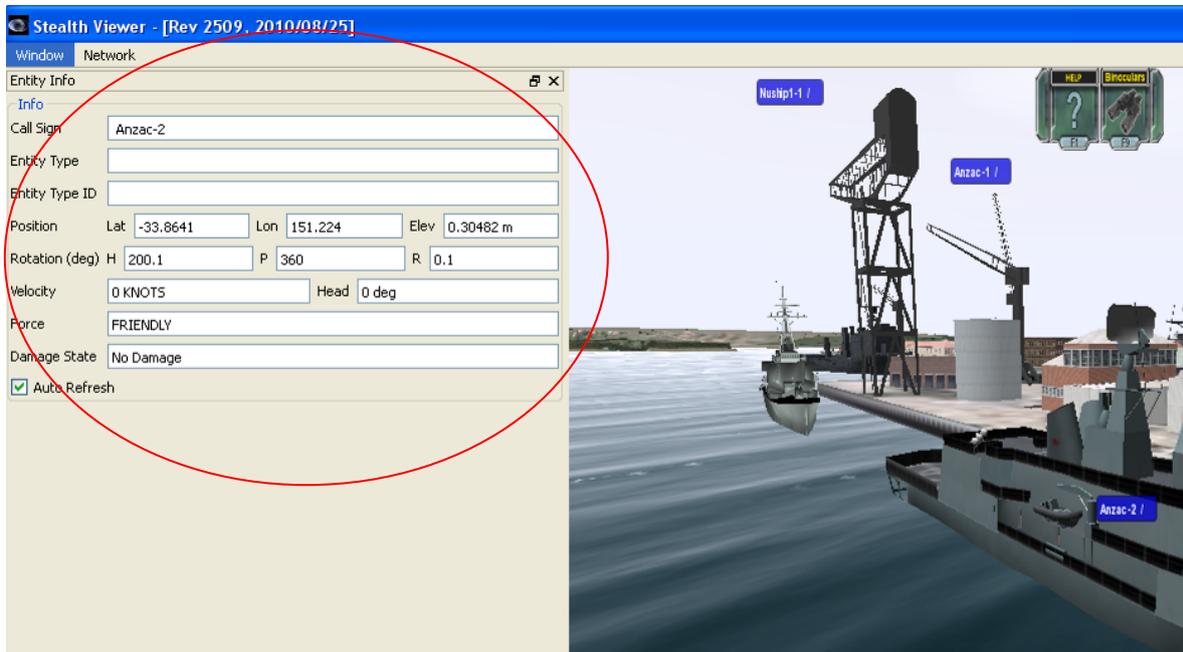


Figure 20 Entity Info Dialog

7. Terrain

The above examples use sample terrain from NSW. There are two high resolution terrains packaged with ADFStealthViewer:

- Sydney Harbour⁹
- Umboi Island off PNG¹⁰

There is corresponding terrain data for Sydney Harbour and Umboi Island provided with ADFStealthViewer, which can be made use of in JSAF. The JSAF terrain can be used as a single cell, or copied into the corresponding world thin directory (i.e. yd0111.s8l for Sydney needs to be copied into the yd directory) to replace the world thin data and create a higher detail terrain within world thin terrain. It is probably best to back up the original terrain file before copying a new one into the corresponding world thin directory.

This is done by copying the desired data file to the JSAF "world_thin" CTDB directory. For example, to use Sydney Harbour terrain, copy the contents of directory:

```
"C:\Program  
Files\DSTO\ADFStealthViewer\data\ProjectAssets\Terrains\SYD\ctdb_8.7\yd"  
into:  
"world_thin*\yd directory".
```

Umboi Island has similar terrain data files for JSAF.

It is advisable to make a backup of the yd directory so it can be restored if needed.

Note: The directory the terrain data is located in may depend on the machine the ADFStealthViewer software was installed on. For a 64 bit machine this would be by default:

```
"C:\Program Files  
x86\DSTO\ADFStealthViewer\data\ProjectAssets\Terrains\SYD\ctdb_8.7\yd"
```

It is possible to change the installation directory of ADFStealthViewer during the installation process.

ADFStealthViewer can load and use terrain data in OpenFlight and Open Scene Graph (OSG) formats.

⁹ Location - 33°51'6.17"S, 151°11'47.92"E

¹⁰ Location - 5°37'10.78"S, 147°57'42.17"E

7.1 Connection to Sydney Harbour Terrain

To use the Sydney Harbour terrain, create a new network connection pointing to the Sydney Map, via the network options dialog, using the settings shown below.

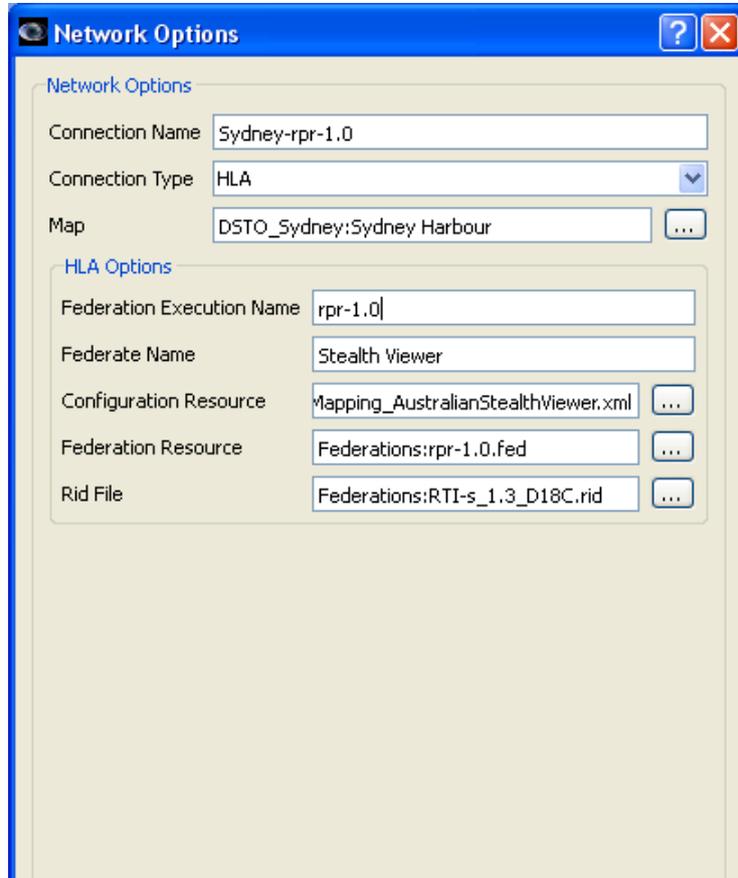


Figure 21 Sydney Harbour Network Connection

Connect to this new network as described earlier in section 4. This should produce the image in Figure 22.

The corresponding JSAF simulation environment view is shown in Figure 23.

A further ADFStealthViewer view of ships in Garden Island is shown in Figure 24.



Figure 22 Stealth Viewer displaying Sydney Harbour.

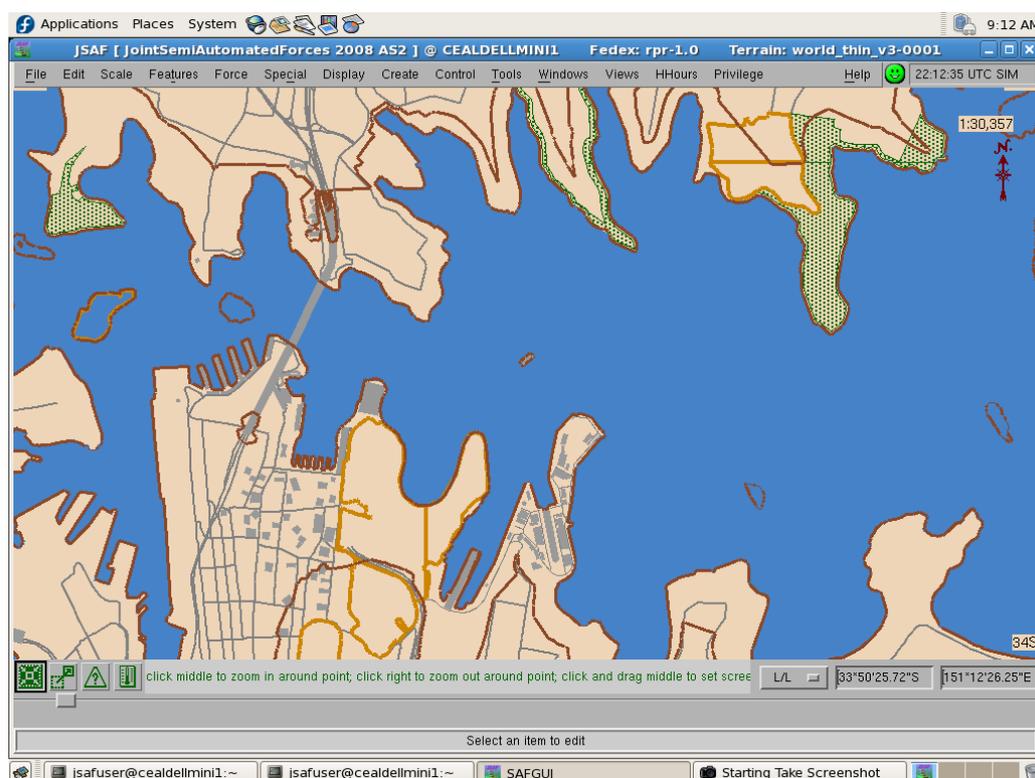


Figure 23 JSAF High detailed terrain of Sydney Harbour

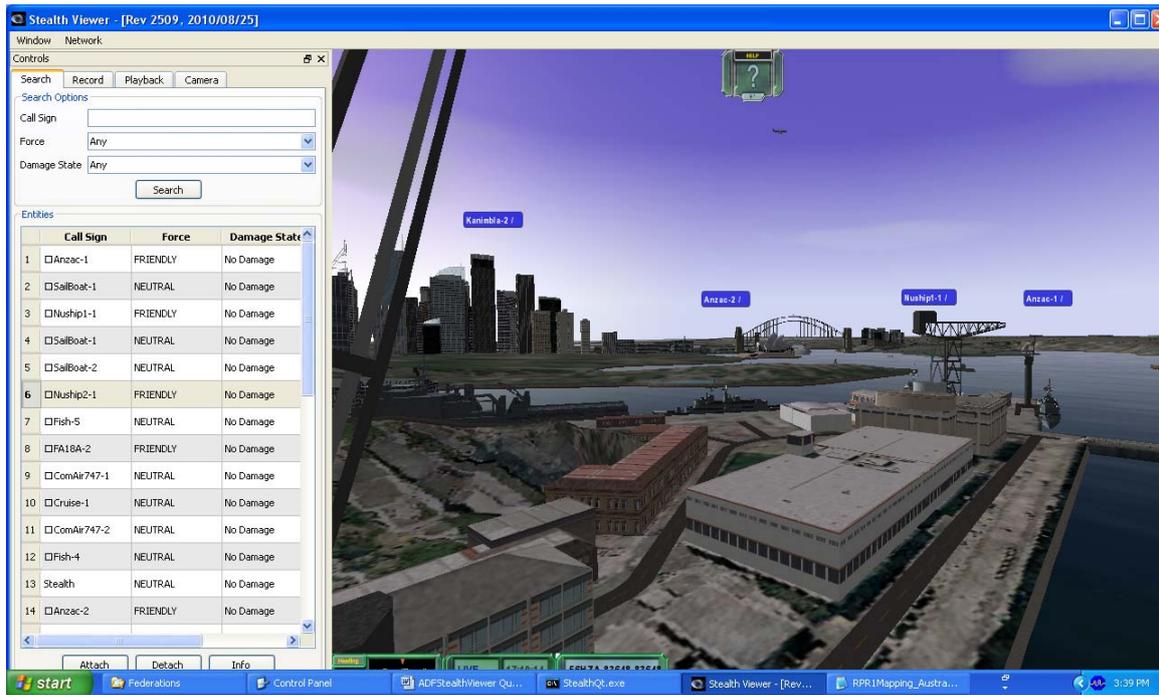


Figure 24 View from Garden Island with some ships on the Harbour

7.2 Bathymetric Data

ADFStealthViewer has Bathymetric data allowing viewing of submerged entities.

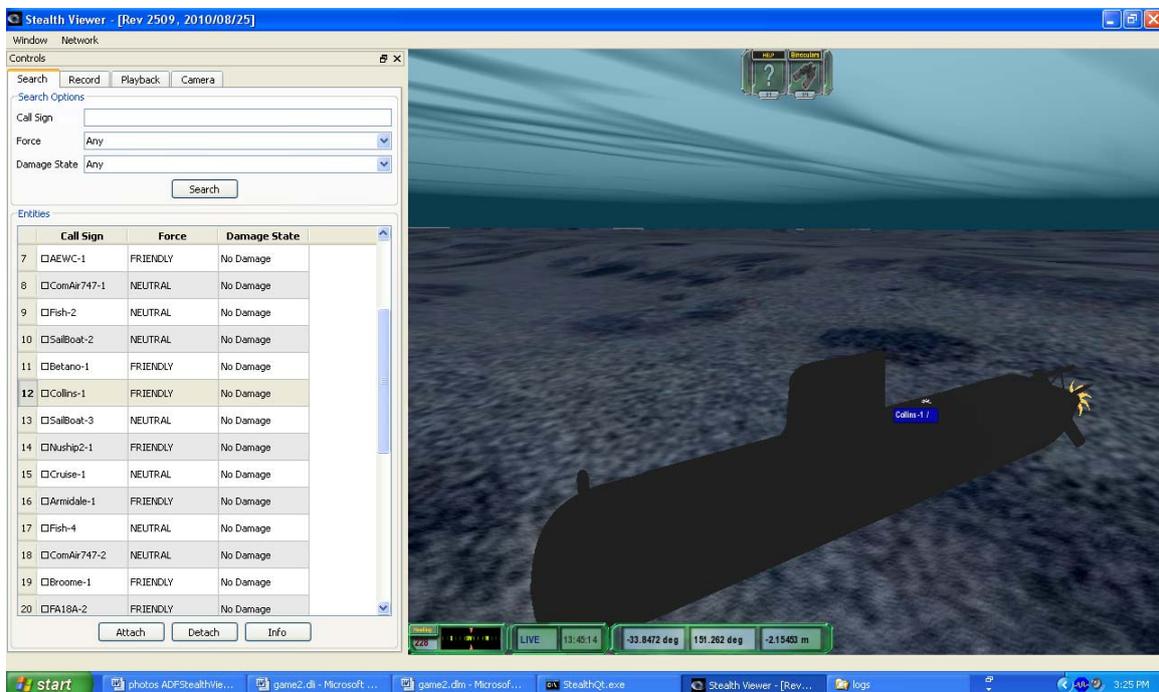


Figure 25 Bathymetric view in ADFStealthViewer

Water colour and roughness can be modified in the terrain's associated map file. The following shows the Water settings for the Sydney Terrain. The file to change is called SYD_Water.dtm found in the "ADFStealthViewer\data\ProjectAssets_Demos\maps" directory. Changing the Water Colour values will change the water colour in the simulation. The Choppiness can also be set but currently does not seem to have much effect on the simulation.

```

<actor>
  <type>SimCore.WaterGridActor</type>
  <id>0527484b-46d0-4f9e-bc0b-3545b045cf29</id>
  <name>WaterGridActor</name>
  <property>
    <name>Rotation</name>
    <vec3>
      <value1>0.000000</value1>
      <value2>0.000000</value2>
      <value3>0.000000</value3>
    </vec3>
  </property>
  <property>
    <name>Translation</name>
    <vec3>
      <value1>0.000000</value1>
      <value2>0.000000</value2>
      <value3>0.000000</value3>
    </vec3>
  </property>
  <property>
    <name>Normal Rescaling</name>
    <boolean>true</boolean>
  </property>
  <property>
    <name>Enable Collision</name>
    <boolean>>false</boolean>
  </property>
  <property>
    <name>Render Proxy Node</name>
    <boolean>>false</boolean>
  </property>
  <property>
    <name>Enable Dynamics</name>
    <boolean>>false</boolean>
  </property>
  <property>
    <name>Mass</name>
    <float>4.1887903</float>
  </property>
  <property>
    <name>Center of Gravity</name>
    <vec3>
      <value1>0.000000</value1>
      <value2>0.000000</value2>
      <value3>0.000000</value3>
    </vec3>
  </property>
  <property>
    <name>Initial Ownership</name>
    <enumerated>Server Local</enumerated>
  </property>
  <property>
    <name>ShaderGroup</name>
    <string>WaterGroup</string>
  </property>
  <property>
    <name>Water Height</name>
    <float>0</float>
  </property>
  <property>
    <name>Water Color</name>

```

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```
<colorRGBA>  
  <valueR>0.039215</valueR>  
  <valueG>0.211764</valueG>  
  <valueB>0.270558</valueB>  
  <valueA>1.000000</valueA>  
</colorRGBA>  
</property>  
<property>  
  <name>Choppiness</name>  
  <enumerated>CHOP_FLAT</enumerated>  
</property>  
</actor>
```

Changing the colorRGBA values, highlighted in red above, in the file enables the user to make the water more green/blue/brown and modifying the roughness of the sea (valueA) gives a more realistic display of water conditions.

8. Displaying Munitions Effects

The stealth viewer can display munitions effects, like bomb blasts, smoke and tracers. This is done via a “MunitionTypes.dtmmap” file. Every munitions type that is to be displayed needs to be mapped in this file and loaded via the config.xml file as an additional map. See the file “ADFStealthViewer\data\ProjectAssets_Shared\maps\DemoMunitionTypesMap.dtmmap” for details on setting up the munitions mappings.

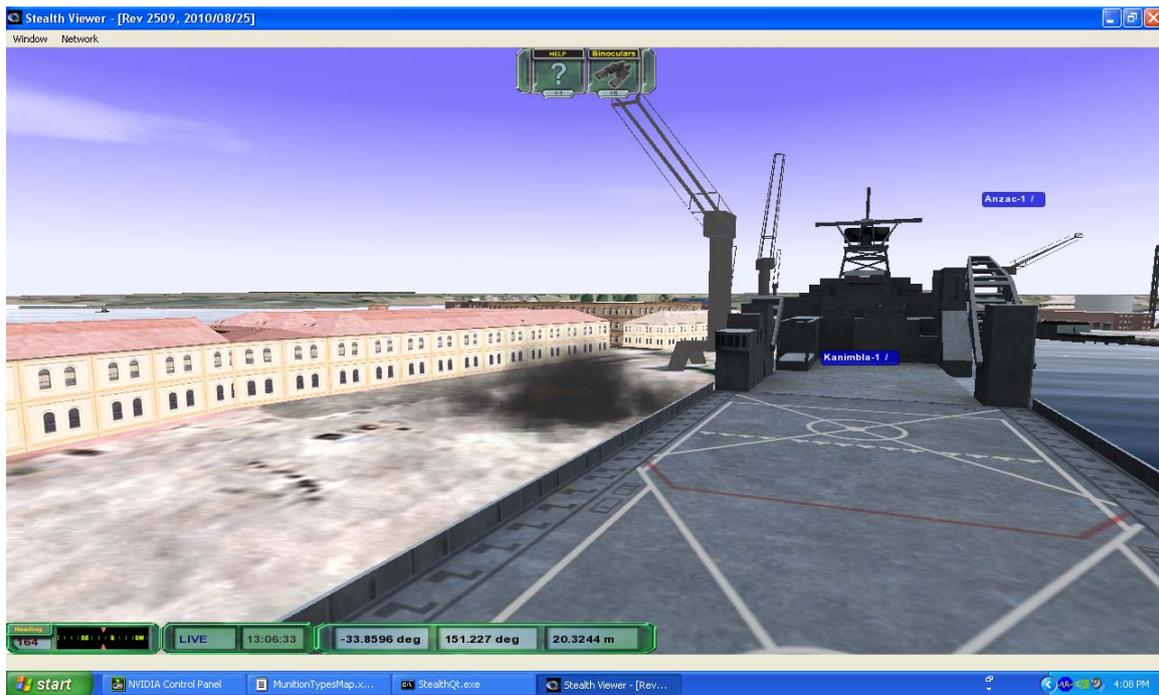


Figure 26 Small diameter bomb explosion

The above explosion is a small diameter bomb simulated in JSAF using the Detonation Tool; this is the only munitions currently mapped and as such is the only detonation that can be displayed. The non mapped detonations will cause the display of a message about this denotation in the ADFStealthViewer command window.

The munitions are mapped via their DIS enumeration to an OSG particle animation.

9. Recording and Playback

ADFStealthViewer has the ability to record and then playback a game. The recording is saved to a file, the name of which is set in the Record Tab of the Controls Window.

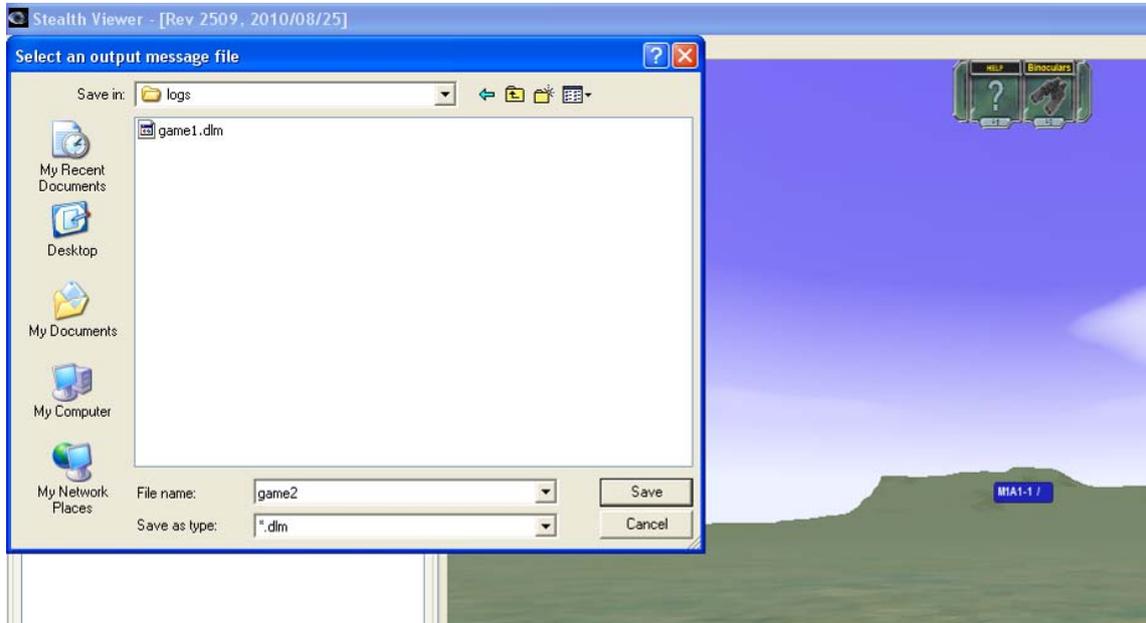


Figure 27 Setting record file

The recording saves all information that is produced in the HLA network to this file and includes all mapped entity updates and interactions. To playback the recording once you have stopped recording, select "Switch to Playback Mode" in the playback Tab on the controls window.

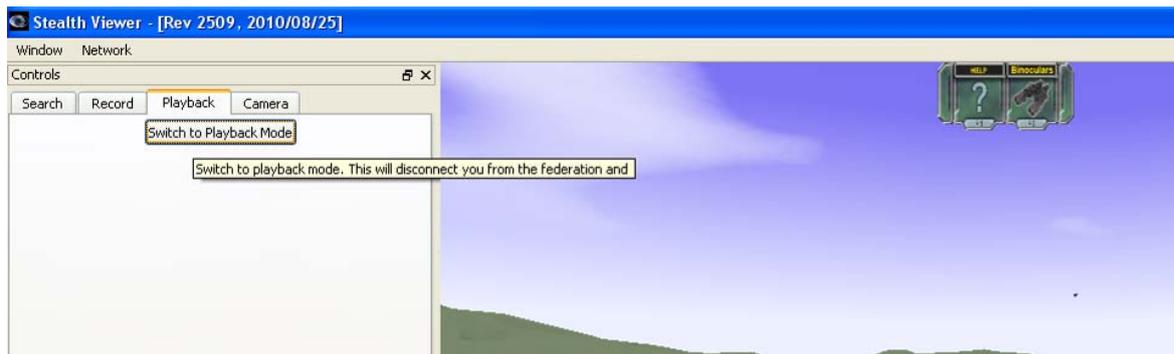


Figure 28 Playing back a recording

The playback is replayed in the ADFStealthViewer after first disconnecting from the HLA network, therefore no information is replayed back to the HLA network. The playback can be seen in real-time, paused and rewound, entities can be attached to and the camera can be moved. This process can potentially be used for after action review.

10. Setting Time of Day

The stealth viewer can set the time of day in the simulation to enable night and day features such as the position of the Sun, lighting, stars and the Moon.

To set the time manually Select the Environment Tab on the Preferences UI. If the Preferences UI is not present it can be displayed by selecting Show Preferences UI from the Window drop down menu.

In Custom Settings the Time can be set to the desired time of day.

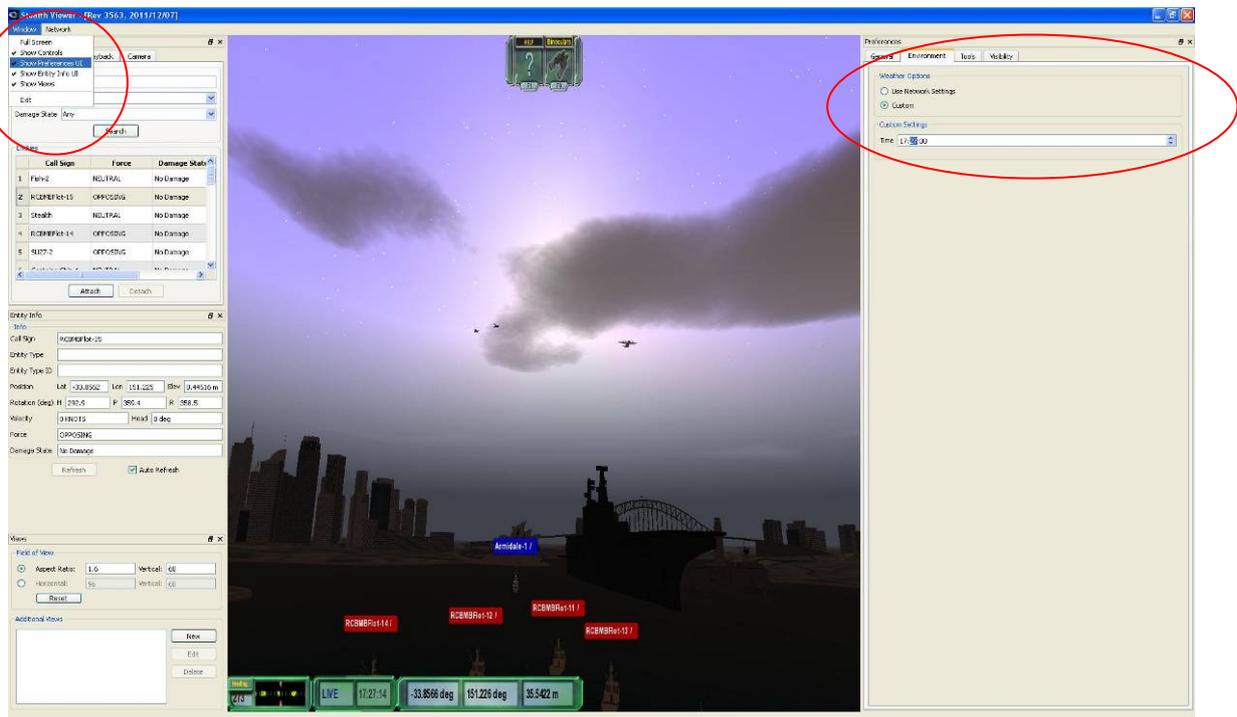


Figure 29 Sydney Harbour evening

Following are some examples of Time of Day settings of the Sydney terrain.

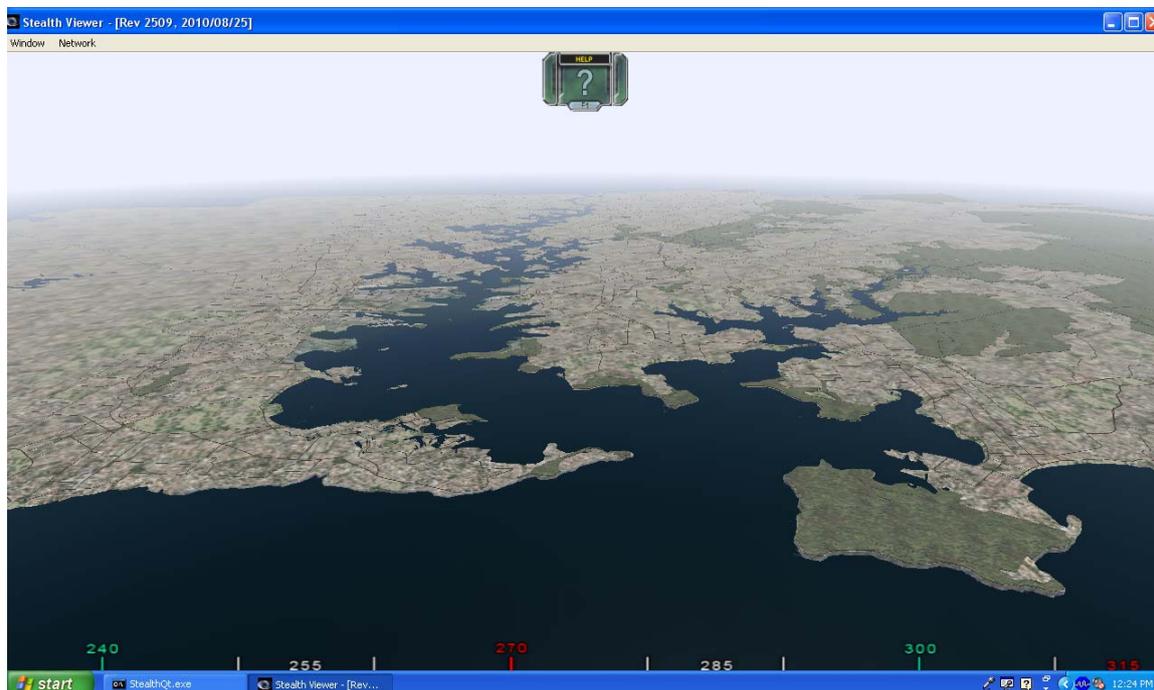


Figure 30 Sydney Day

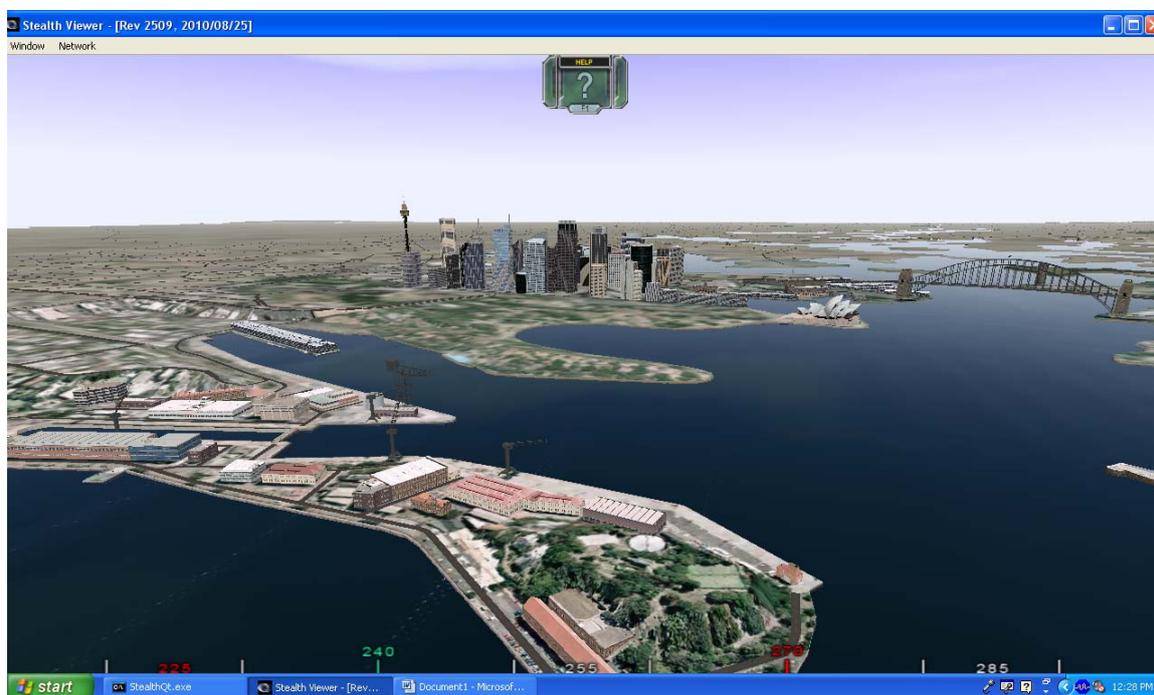


Figure 31 Garden Island Day

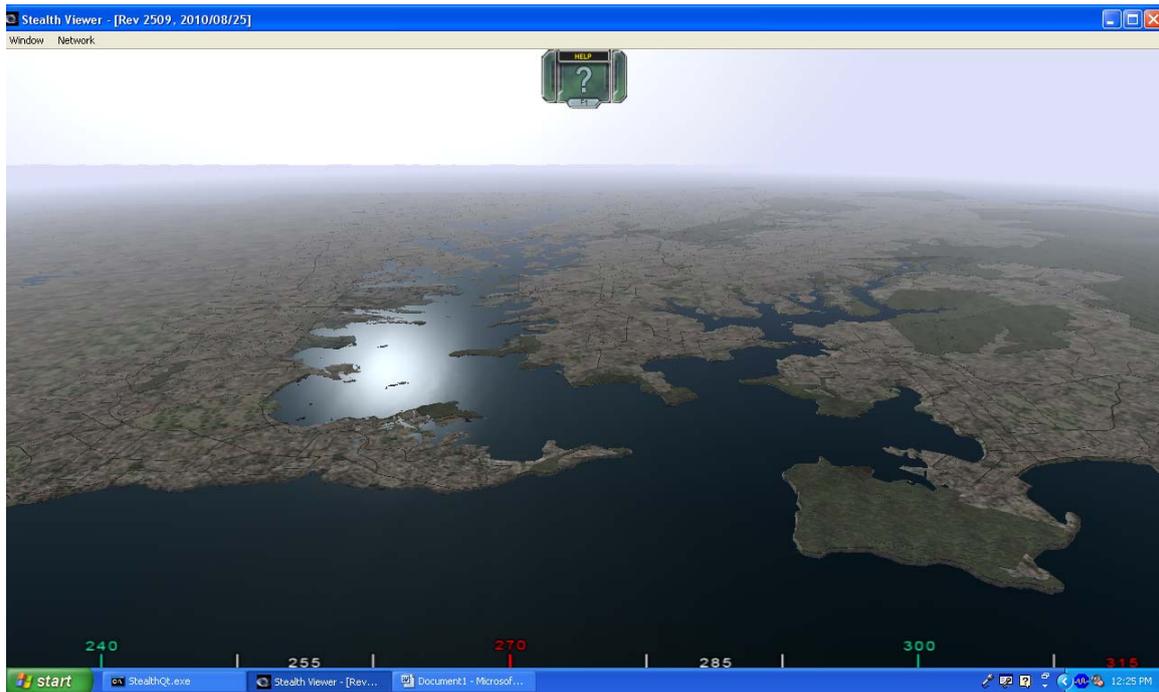


Figure 32 Sydney Afternoon



Figure 33 Garden Island Afternoon

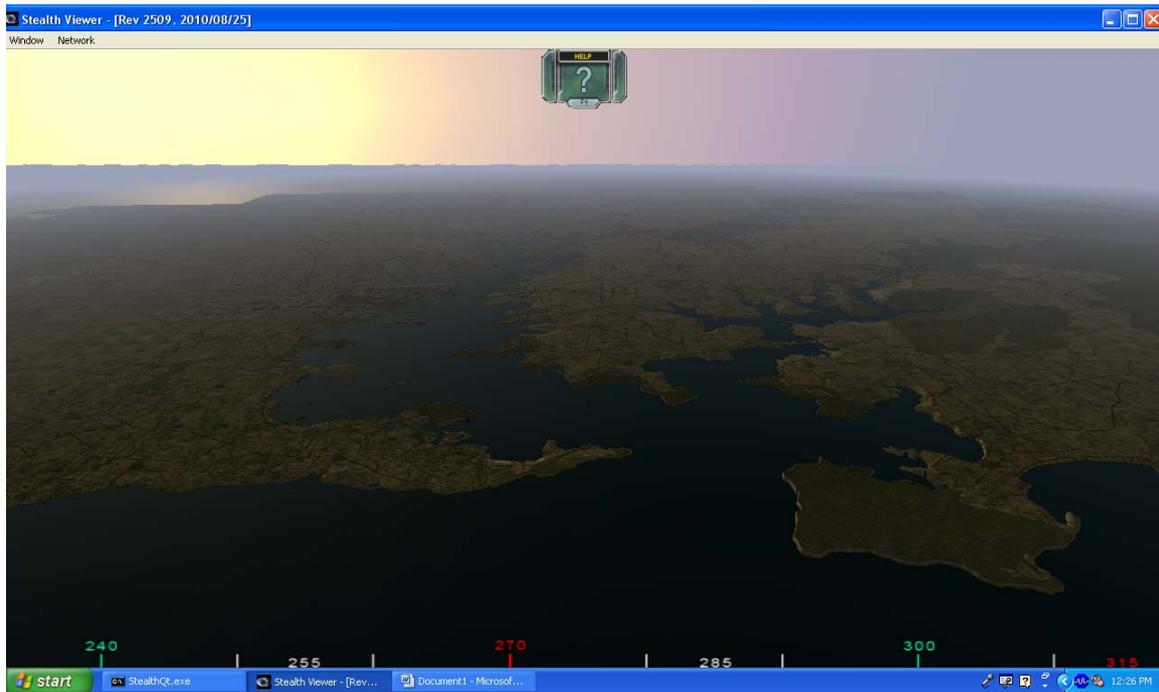


Figure 34 Sydney Evening



Figure 35 Garden Island Evening

11. Binoculars

The following shows a view from the top of the Sydney Harbour Bridge not using binoculars then a view using binoculars. The magnification of the binoculars can be modified in the Tools Tab of the preferences window. The Binoculars are invoked by selecting F9. There are other tools like a 360 degree compass, GPS, night vision goggles that have not yet been investigated.



Figure 36 View from top of Sydney Harbour Bridge



Figure 37 Binoculars from top of Sydney Harbour Bridge

12. Creating Views

Views or secondary cameras relative to the original camera can be created. The following shows the creation of 6 cameras to give a 360 degree view around a ship.

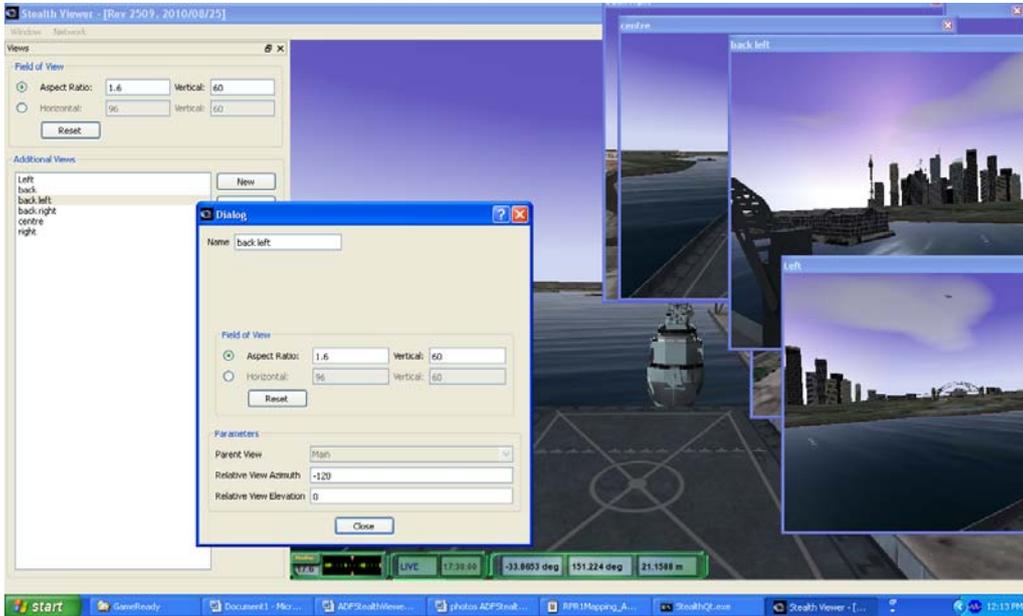


Figure 38 Creating Views

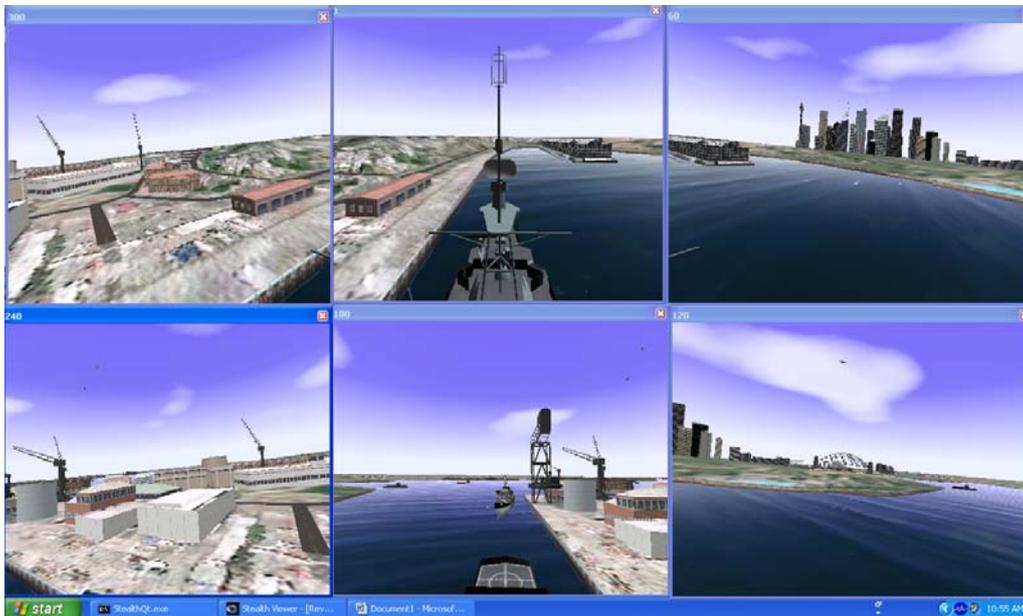


Figure 39 Views showing 360 Degrees around ship

The following shows two views left and right while attached to a ship.



Figure 40 Left and Right Views from ship

13. DIS Mode

The Stealth Viewer can be also be used in DIS Mode if the simulation software used can not communicate using HLA but can communicate using DIS. This is achieved by selecting DIS when setting up the connection type. The IP Address will be system specific. For the test setup it was the machine that was running the DIS gateway. Set this IP Address to the DIS machine on the network¹¹.

When in DIS mode the main setting is the actorMap, which can be found in the data\ProjectAssets_Demos\Federations directory from the base install directory of ADFStealthViewer. The actorMap is a mapping between DIS id's and 3D model representation of entities.

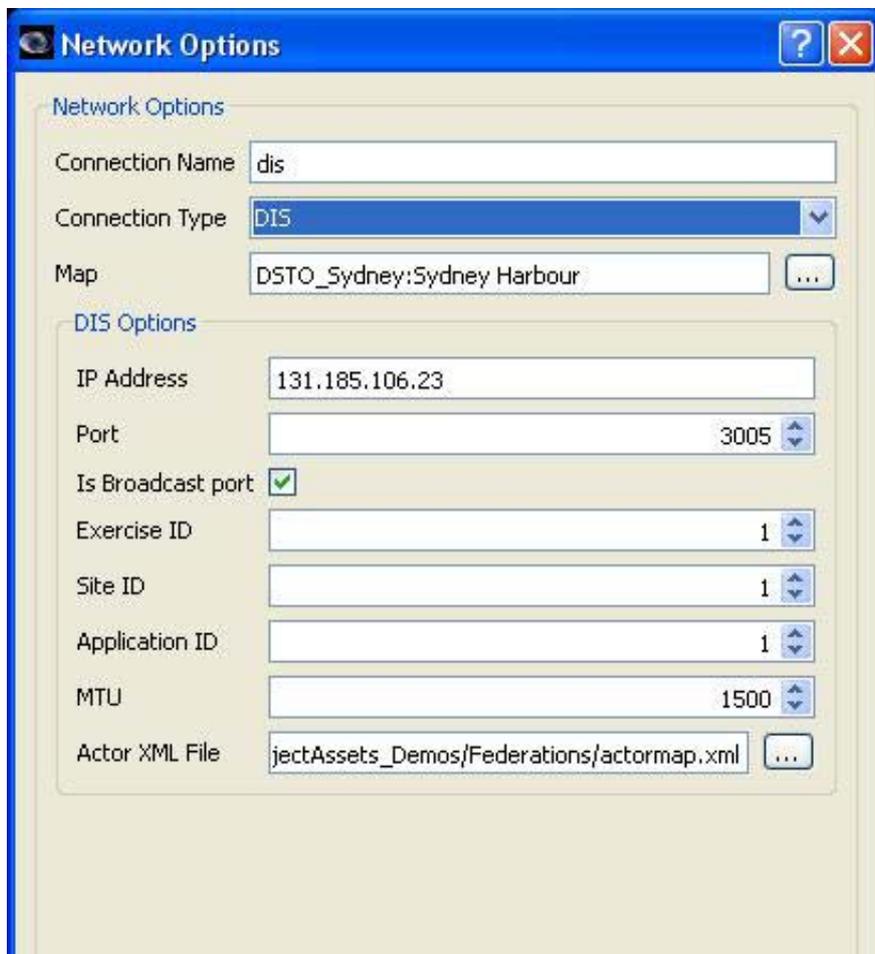


Figure 41 DIS Network Options

¹¹ It is not known if any machine can be specified as the test setup used only had one DIS gateway and no DIS simulators.

14. KML Gateway

A KML gateway is a tool that acts as a bridge converting the simulation HLA or DIS data into a KML format. KML is an XML based description of features (images, polygons, 3D Models, place marks, etc) in a geospatially context for display on 3D globe such as Google Earth or NASA World Wind.

A plug-in has been created to enable turning ADFStealthViewer into an HLA to KML Gateway. This permits all entities including HLA detections to be displayed on something that can read KML - Google Earth for example. ADFStealthViewer acting as a KML Gateway also has the ability to record the data to a KML file. This currently only works with windows XP and an IIS web server machine but could be easily ported to work on a Linux / Apache setup or Apache on Windows.

14.1 Setting up the Machine for KML

The machine that is running the KML gateway first needs to be set up to run Microsoft's IIS web server.

Make sure IIS is installed and running on the machine. This is achieved by selecting "Add or Remove Programs" from the windows control panel. Click on "Add/Remove Windows Components". Select "Internet and Information Services (IIS)" then select next to install. A windows XP installation CD may be needed.

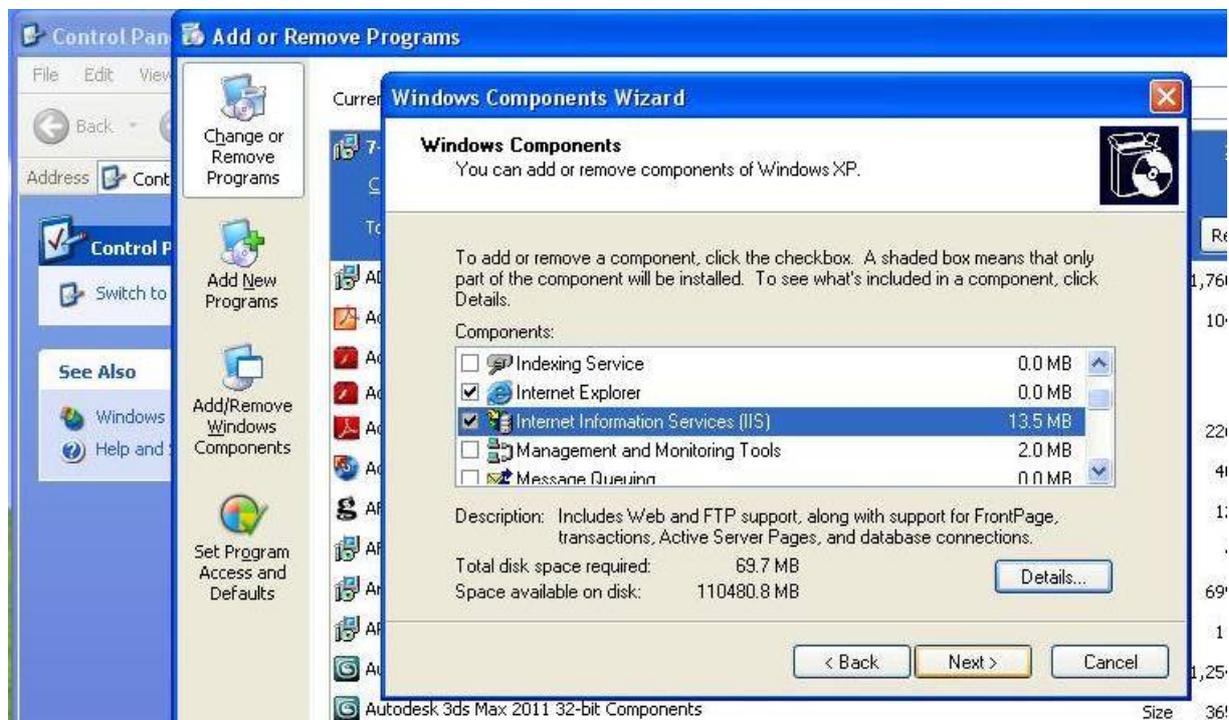


Figure 42 Configuring IIS

Copy the zip files images.zip and models.zip from the ADFStealthViewer\KMLEntityLib Directory to the IIS directory C:\inetpub\wwwroot\.

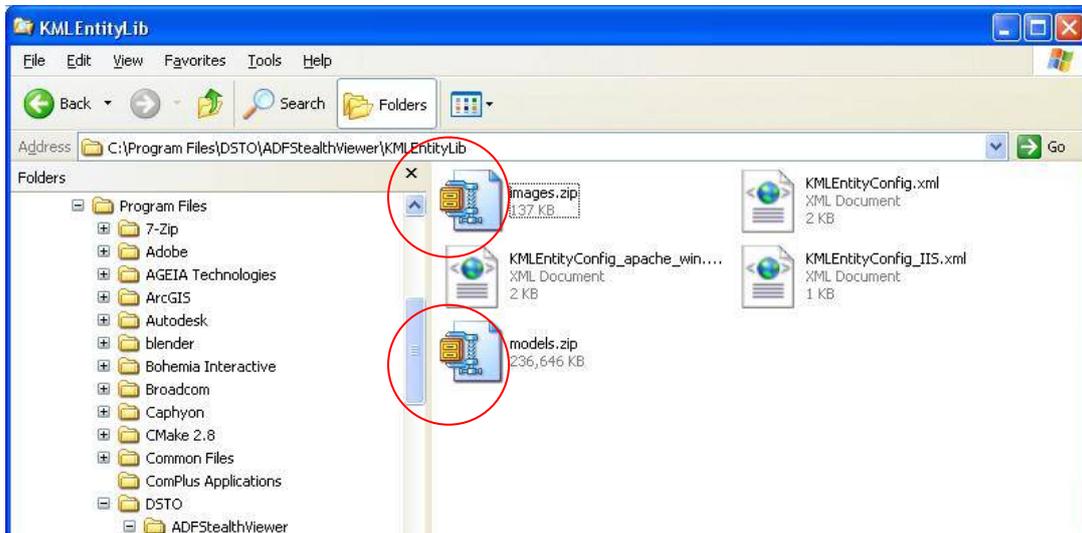


Figure 43 KMLEntity File Locations

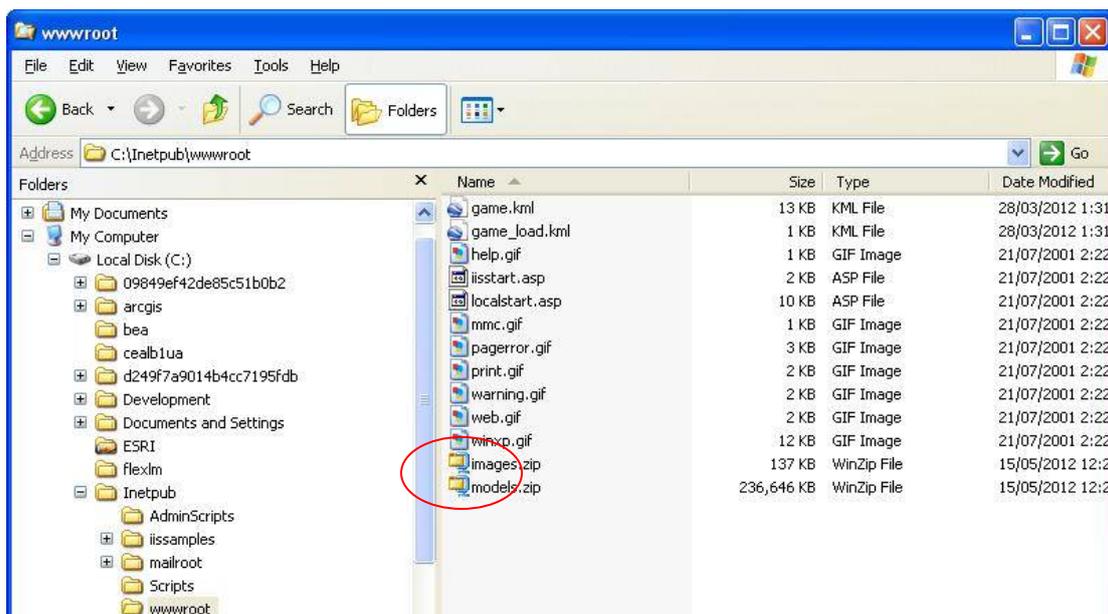


Figure 44 IIS Root Directory

Unzip the models and the images zip files in this directory.

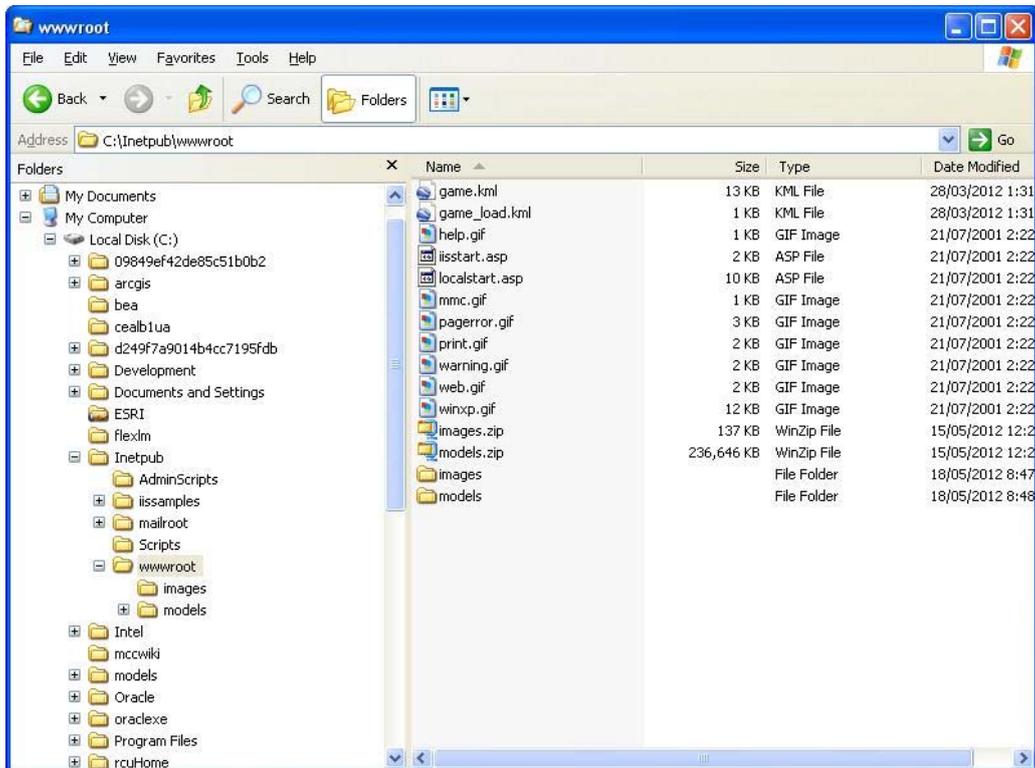


Figure 45 Unzipped models and images files

The KMLEntityConfig.xml file needs to be copied from the ADFSteahtViewer\KMLEntityLib directory into the ADFSteahtViewer\bin directory.

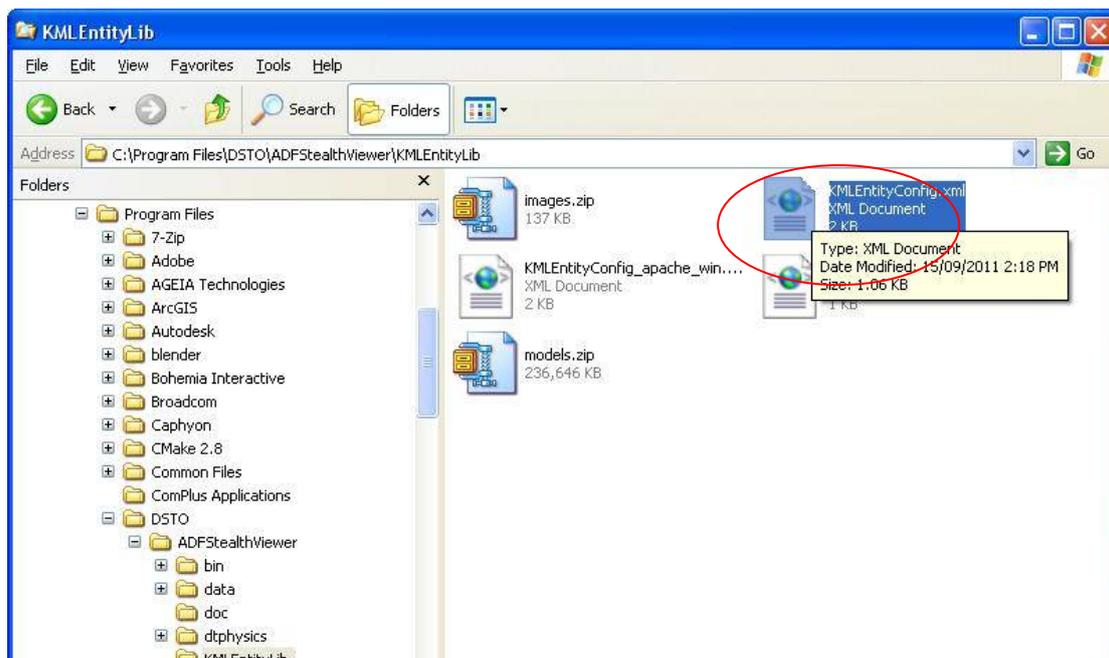


Figure 46 KMLEntityConfig.xml original file

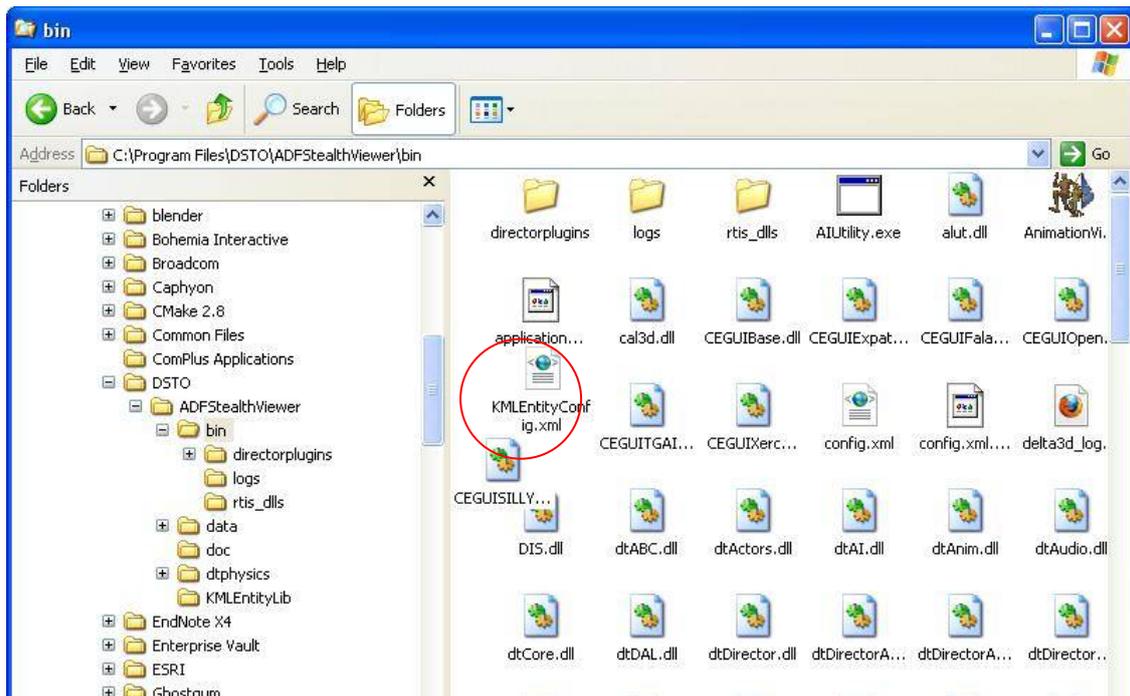


Figure 47 KMLEntityConfig.xml in Bin Directory

Set up the KMLEntityConfig.xml file for basic configuration.

When setting up the network in ADFStealthViewer select the following connection configuration.

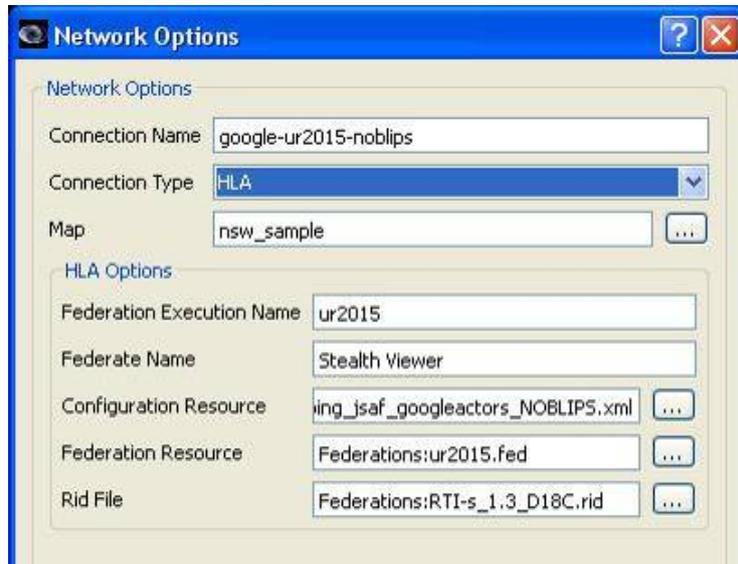


Figure 49 Network Options for HLA KMLEntity Configuration

Note: The Configuration Resource selected for this example is ur2015Mapping_jsaf_googleactors_NOBLIPS.xml
 Similarly the connection for DIS is as follows, with the actormap selected being actormap_kml.xml

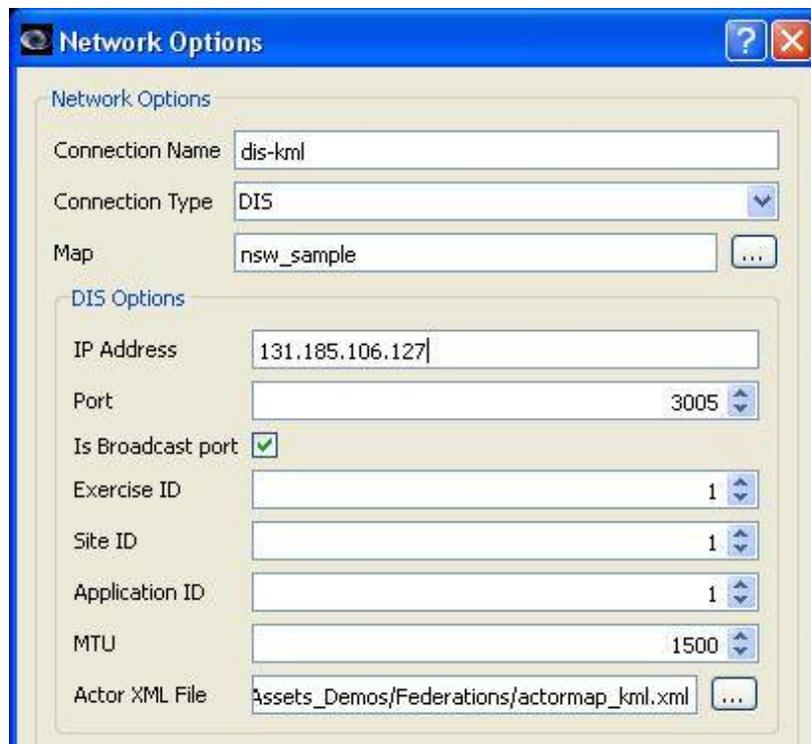


Figure 50 Network Options for DIS KMLEntity Configuration

Notes:

1. The IP Address will be installation specific.
2. Ensure the sample terrain is used; anything larger unnecessarily consumes graphic resources as ADFStealthViewer is used to convert to KML.

If this procedure runs and connects to the corresponding HLA or DIS simulation the KML files can be viewed live in Google Earth. As the HLA federate has been changed to ur2015, while running JSAF, this federate needs to be selected.

To view the entities in Google Earth, open the following files `blueview-game_load.kml`, `redview-game_load.kml` and `neutralview-game_load.kml` in the `c:\inetpub\wwwroot` directory that should have been generated when the stealth viewer is connected. The filenames can be changed in the configuration file. These files can be opened on a remote machine with Google Earth by opening http://hostmachine/blueview-game_load.kml in a web browser (tested using chrome), providing it can get a name resolution to the host machine. This can be used to set up separate white, blue and red views on different instances of Google Earth (which is potentially useful for war-games).

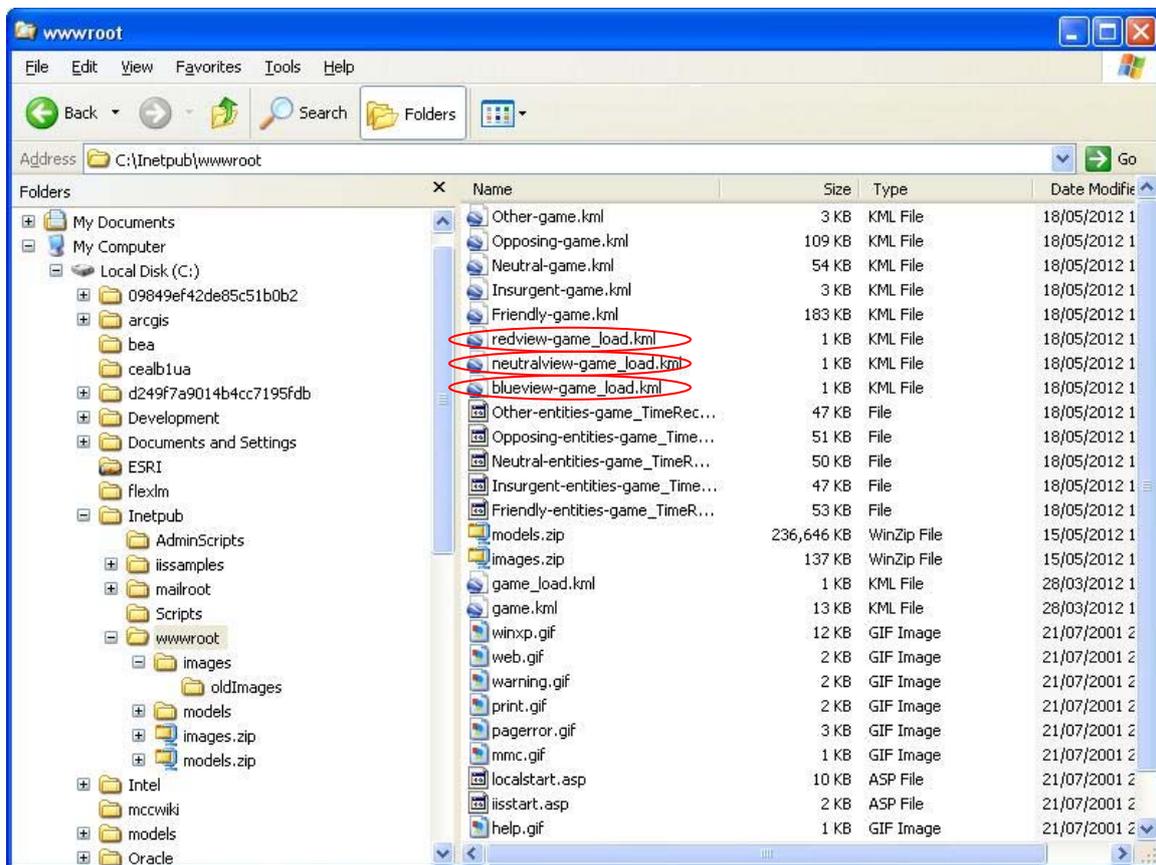


Figure 51 Location KML files are written too

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If Google Earth is installed, double clicking on these files should open them in Google Earth, giving the following image. Otherwise launch Google Earth and manually open the files.

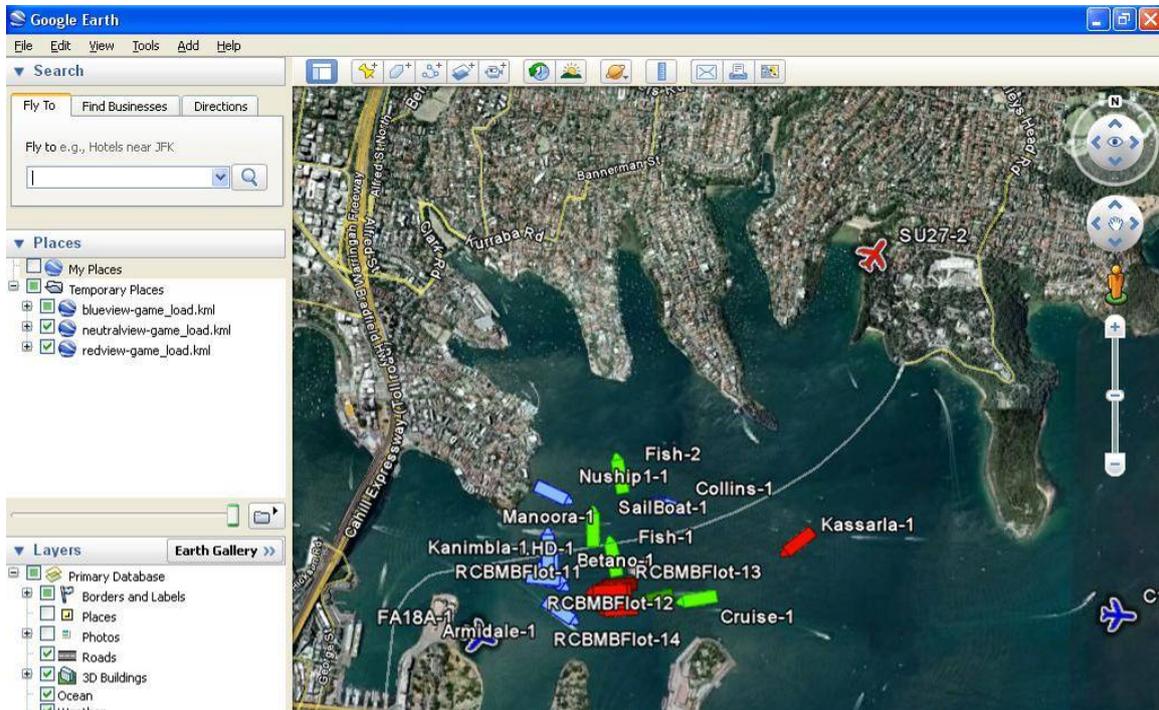


Figure 52 Simulation Entities in Google Earth

The KMLEntityConfig.xml file can also be set up to display as NTDS military icons. This is achieved by setting `<NTDSIcons>true</NTDSIcons>` in the KMLEntityConfig.xml file.

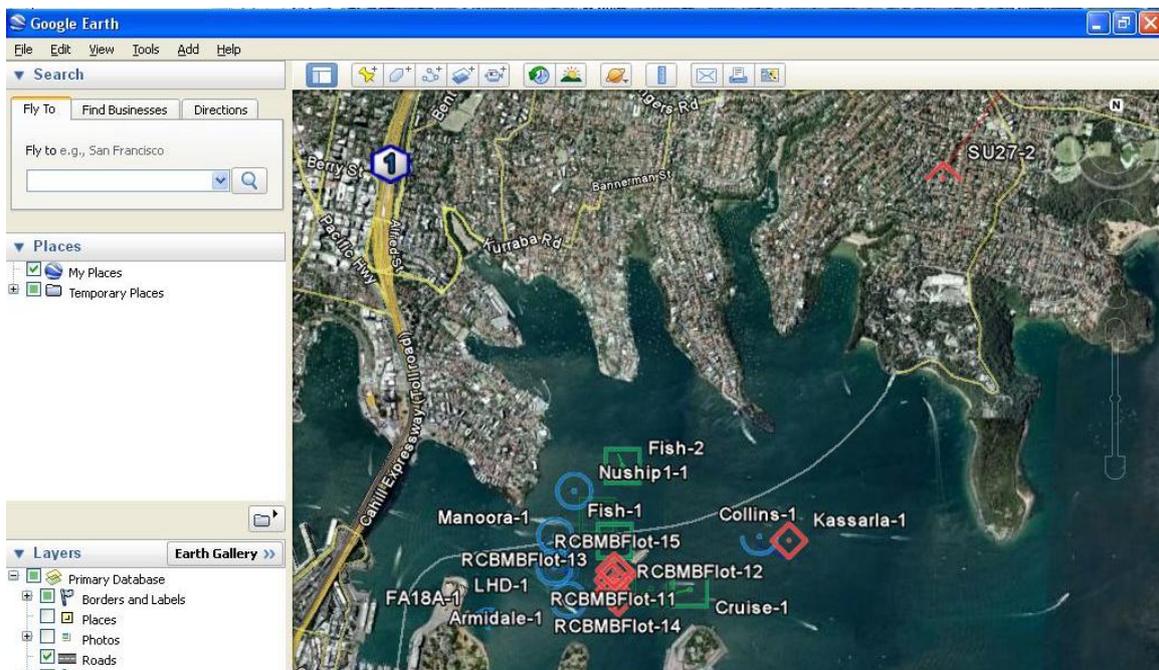


Figure 53 Simulation Entities in Google Earth with NTDS icons setup

Certain HLA federations can send messages about blips or detections which can also be displayed in Google Earth. The following shows the ur2015 federation with the mapping file set up to display blips. Detections cannot currently be shown in DIS mode.

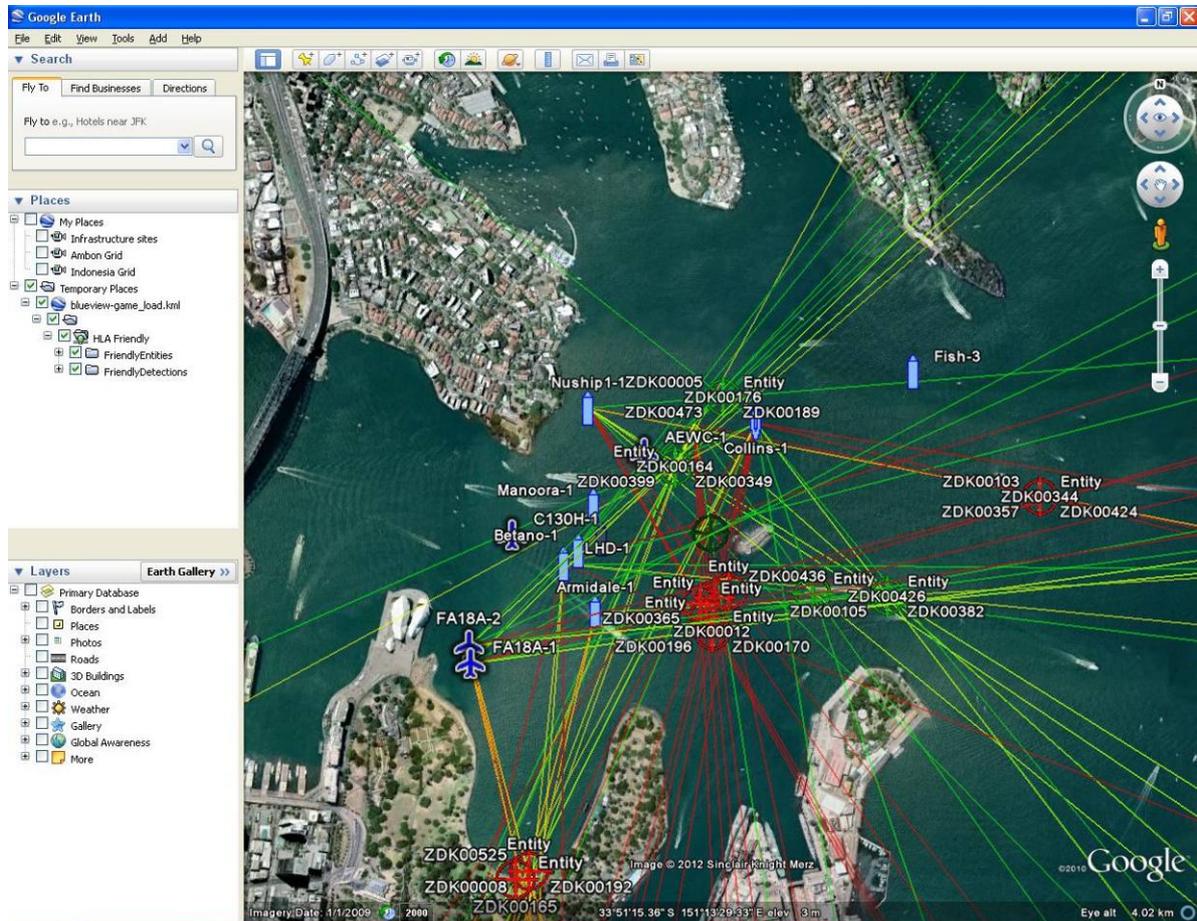


Figure 54 Simulation Entities in Google Earth with Blips Configured

Entities can also have range rings attached to them in the Mapping files, see ur2015Mapping_jsaf_googleactors_rangerings.xml for details on how range rings are added. They are added as a Property during within the description of each entity.

```

<attrToProp>
  <gameName>Google Range Rings</gameName>
  <gameDataType>STRING</gameDataType>
  <default>BlueRing8K</default>
</attrToProp>

```

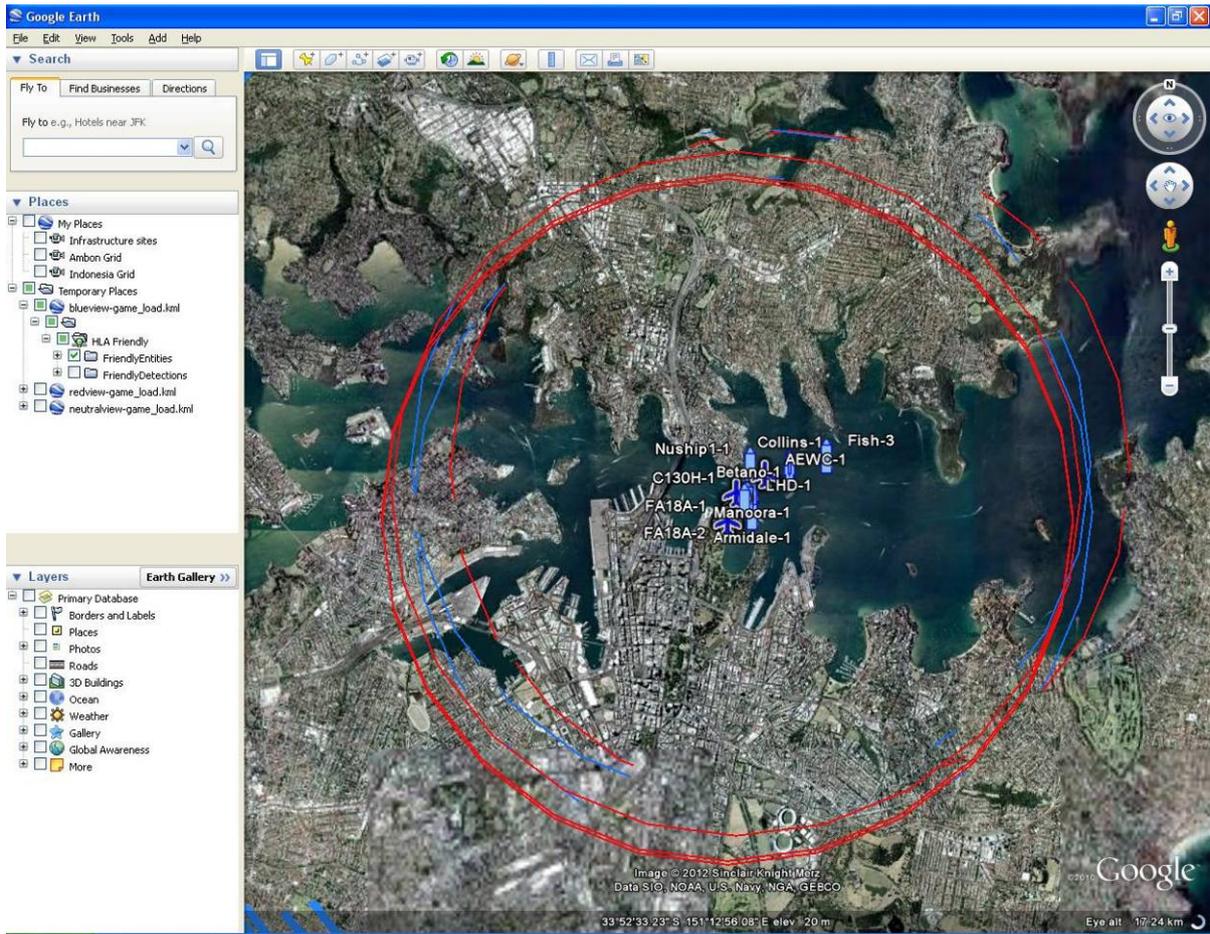


Figure 55 Simulation Entities in Google Earth with Range Rings Associated

14.2 Replaying recorded KML

If recording was set, the KML files can be reloaded into Google Earth for playback. Currently only the TimeStamped recording works, as apposed to creating an animation of the game. This Time Stamped recording allows the Google Earth globe to be moved whilst replay is happening. The text emphasised in bold in the configuration file need to be set up as follows to enable basic recording.

```
<KMLTimeRecordFileName>game_TimeRecord.kml</KMLTimeRecordFileName>
<KMLRefreshRate>3.0</KMLRefreshRate>
<KMLFileDirectory>C:\inetpub\wwwroot</KMLFileDirectory>
<RecordingOn>true</RecordingOn>
<AnimationRecording>>false</AnimationRecording>
<TimeStampRecording>True</TimeStampRecording>
<RecordRangeRings>>false</RecordRangeRings>
<RecordEntities>true</RecordEntities>
<RecordDetections>>false</RecordDetections>
<EntityUpdateInterval>5</EntityUpdateInterval>
<EntityRecordInterval>60</EntityRecordInterval>
```

The files to be loaded to enable recording will be called Friendly-entities-game_TimeRecord.kml for friendly entities. Similar files will be created for Opposing and Neutral recorded entities and if recorded there will be detection files for each of the three views.

Double click on the Friendly-entities-game_TimeRecord.kml found in c:\inetpub\wwwroot directory

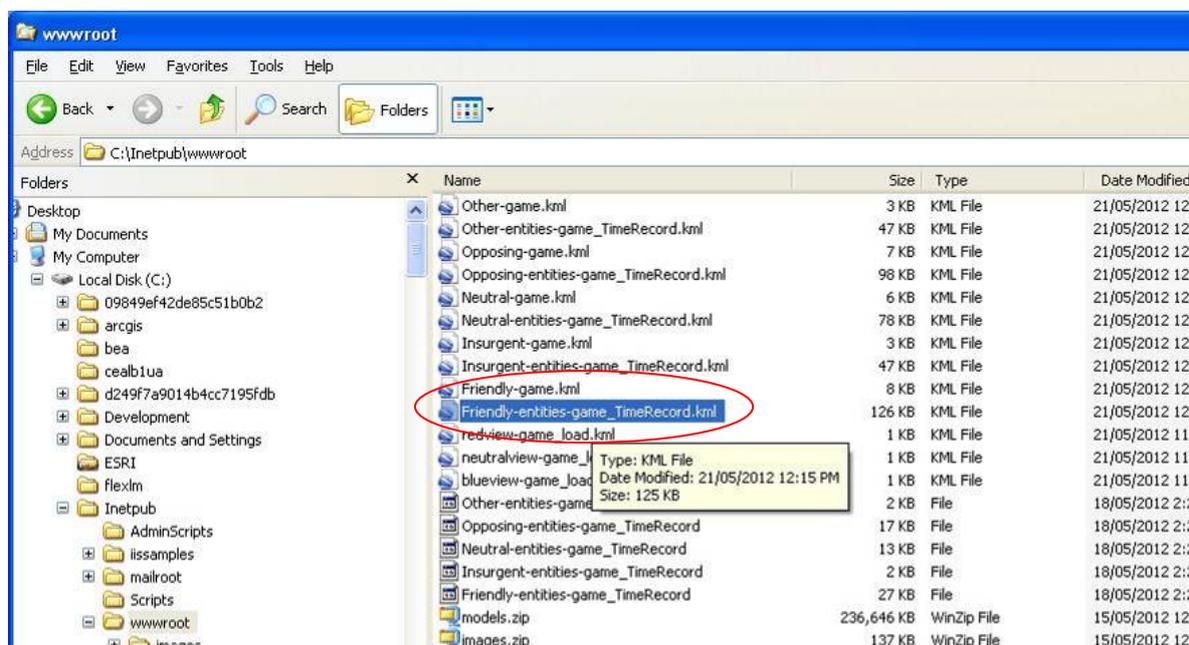


Figure 56 KML Record File Location

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The file could be opened on a remote machine with Google Earth by opening http://hostmachine/Friendly-entities-game_TimeRecord.kml in a web browser (tested using chrome), providing it can get a name resolution to the host machine.

The following shows the initial view when both the friendly and opposing entities recorded file are open.

Initially all the recorded instances of the entities are displayed. This can be reset to the start position by selecting then deselecting the Temporary Places folder in the Google Earth side bar that contains the Time Record documents loaded by the files. Alternatively each Time Record Document displayed in the Google Earth Side Bar Can be deselected and reselected manually.

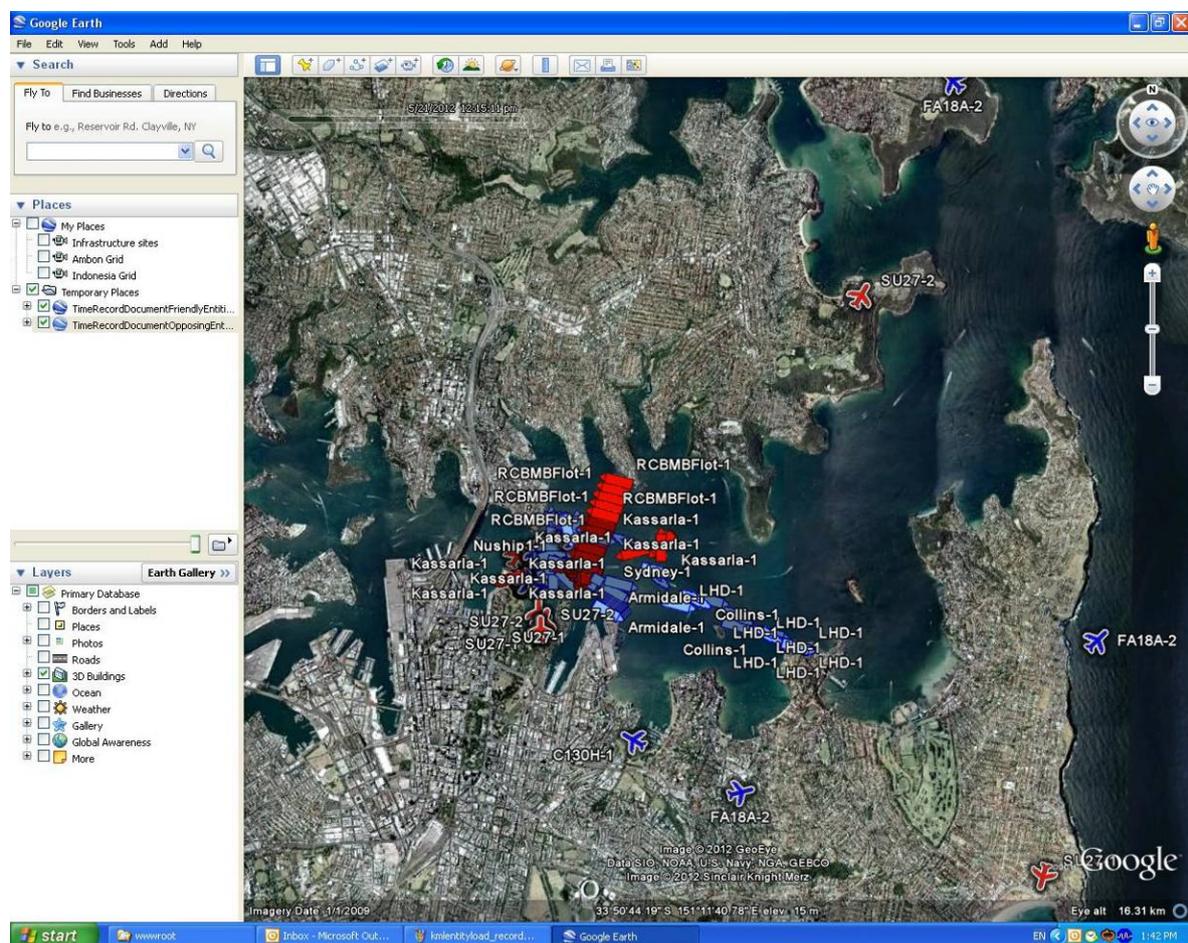


Figure 57 Replaying a KML Recorded File

The following displays the initial view of the Time Recorded files.

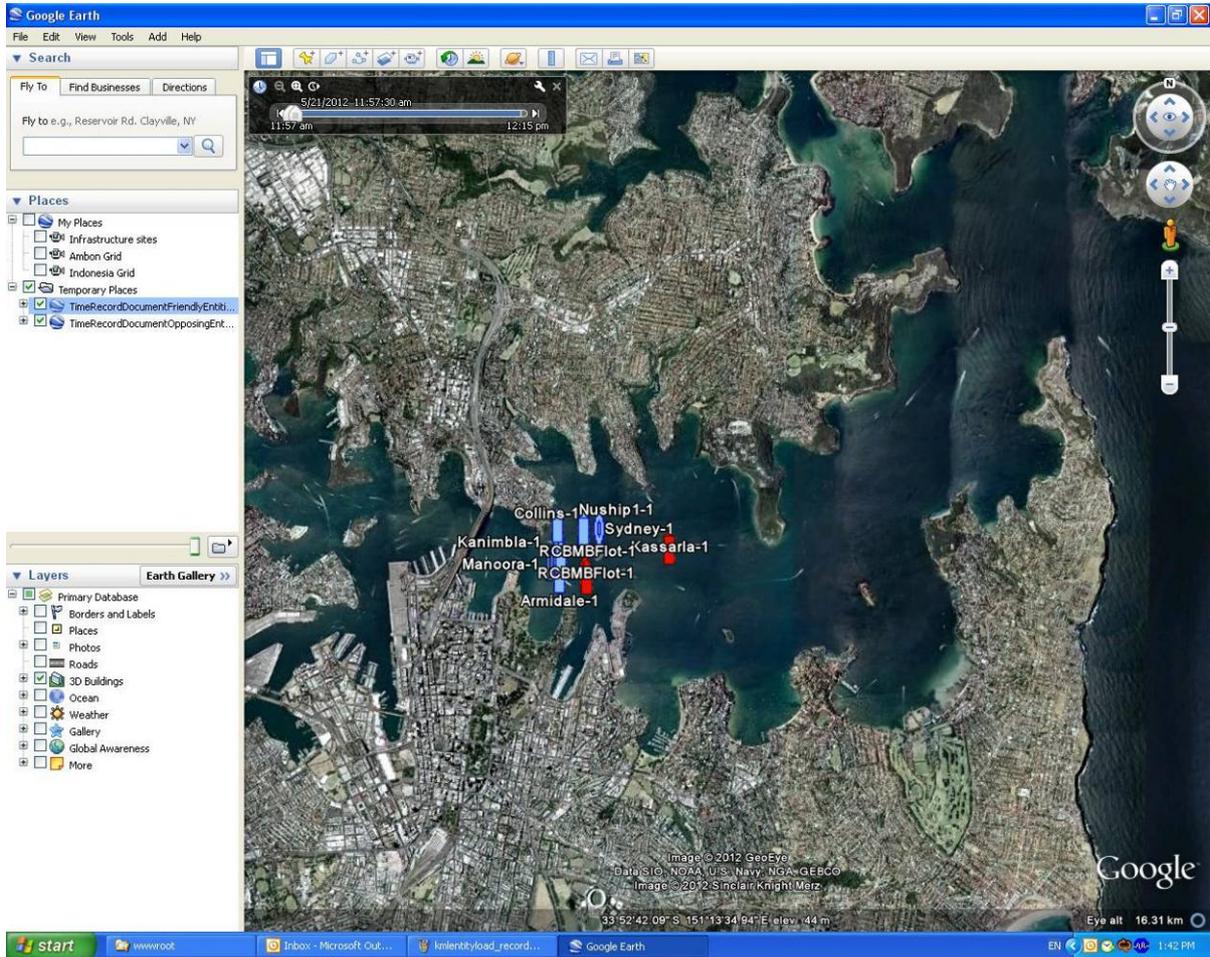


Figure 58 Initial View of KML Replay

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To watch the replay select the play button on the time slider animation toolbar.

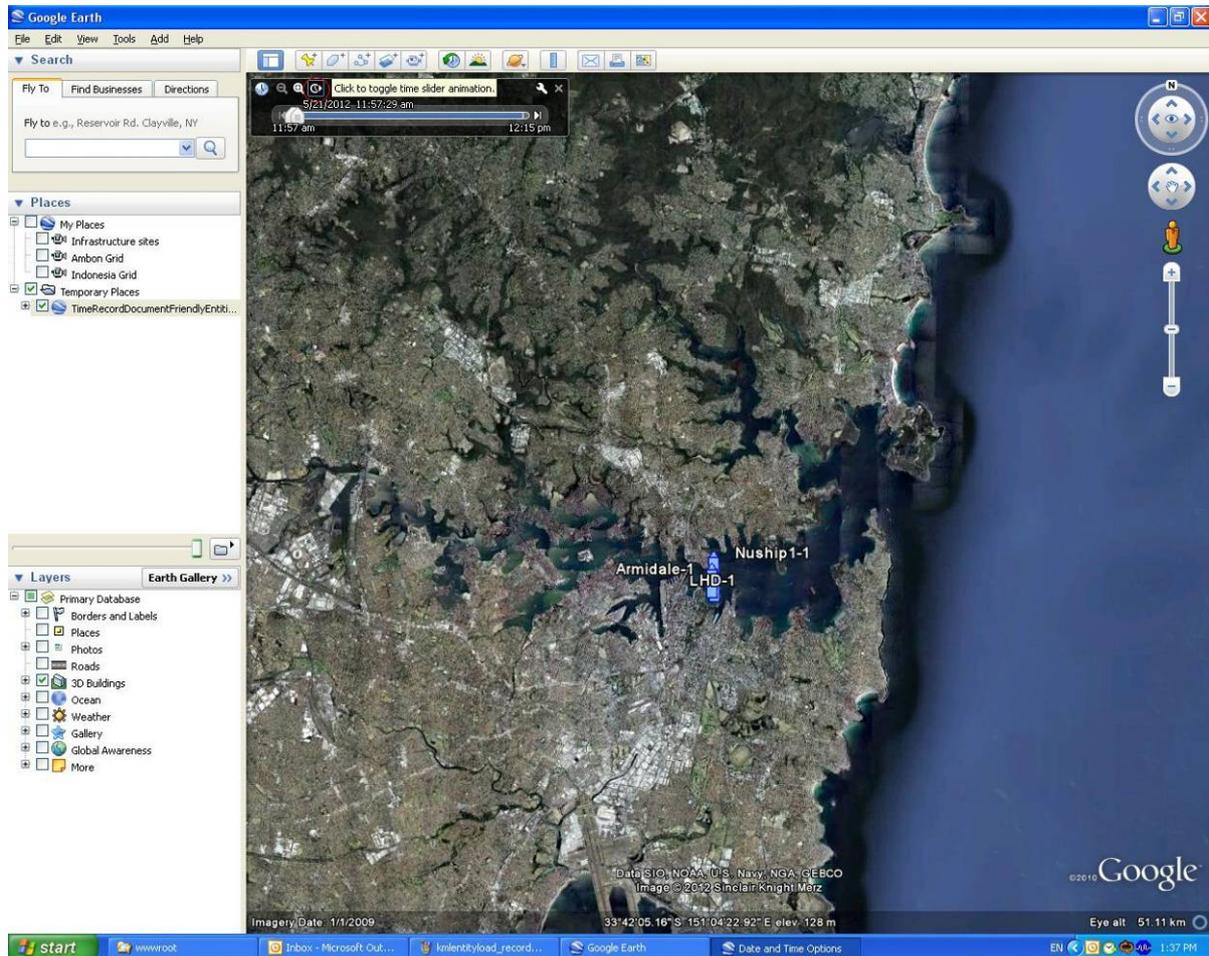


Figure 59 Selecting Play on KML Replay

This should have the entities moving around the screen as the time slider moves, displaying them as they were at the time of recording.

The following shows a snapshot of the animation of a friendly force running.

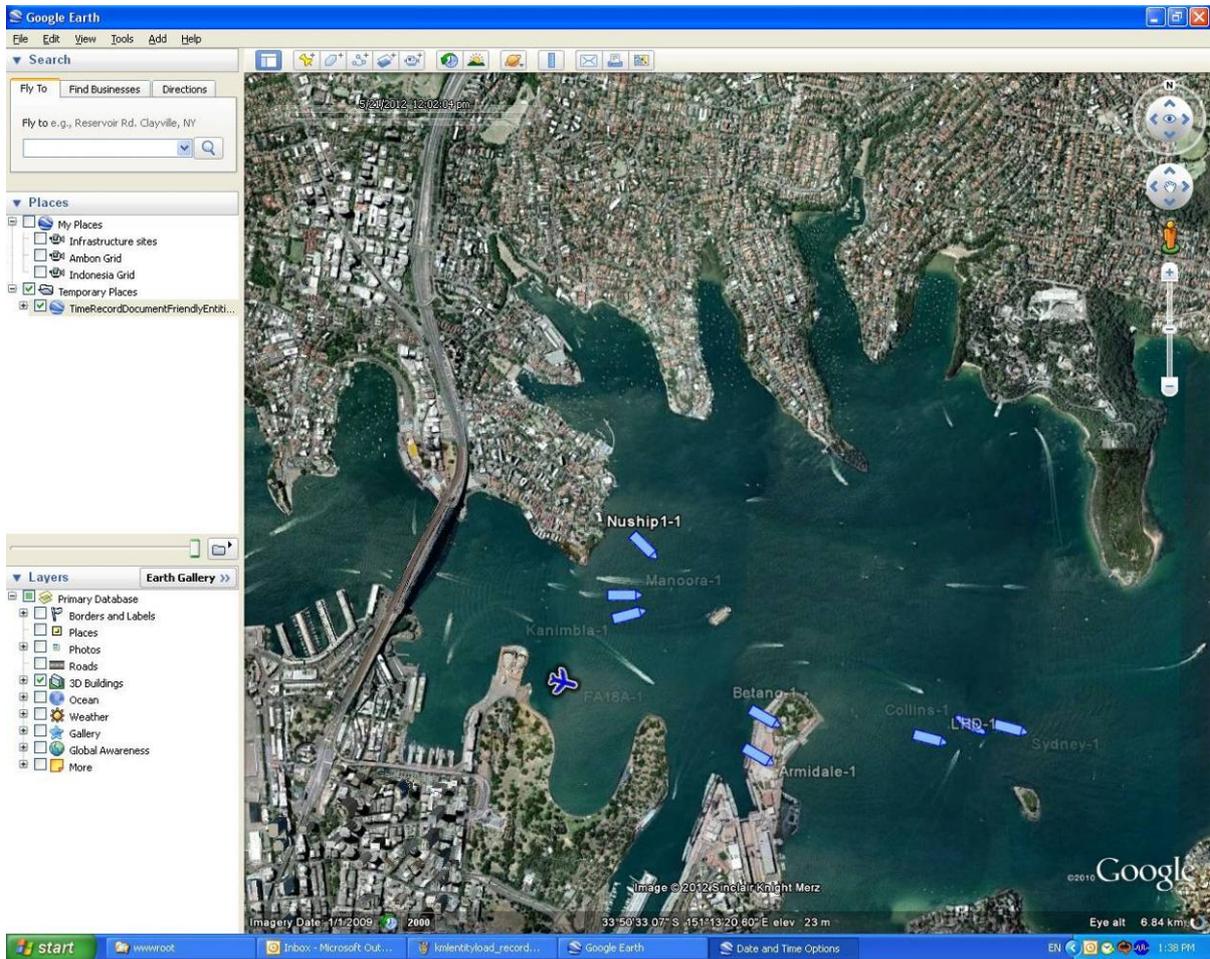


Figure 60 Running Replay of KML Record

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The slider can be moved back and forward to display the recorded state at any time during the simulation.

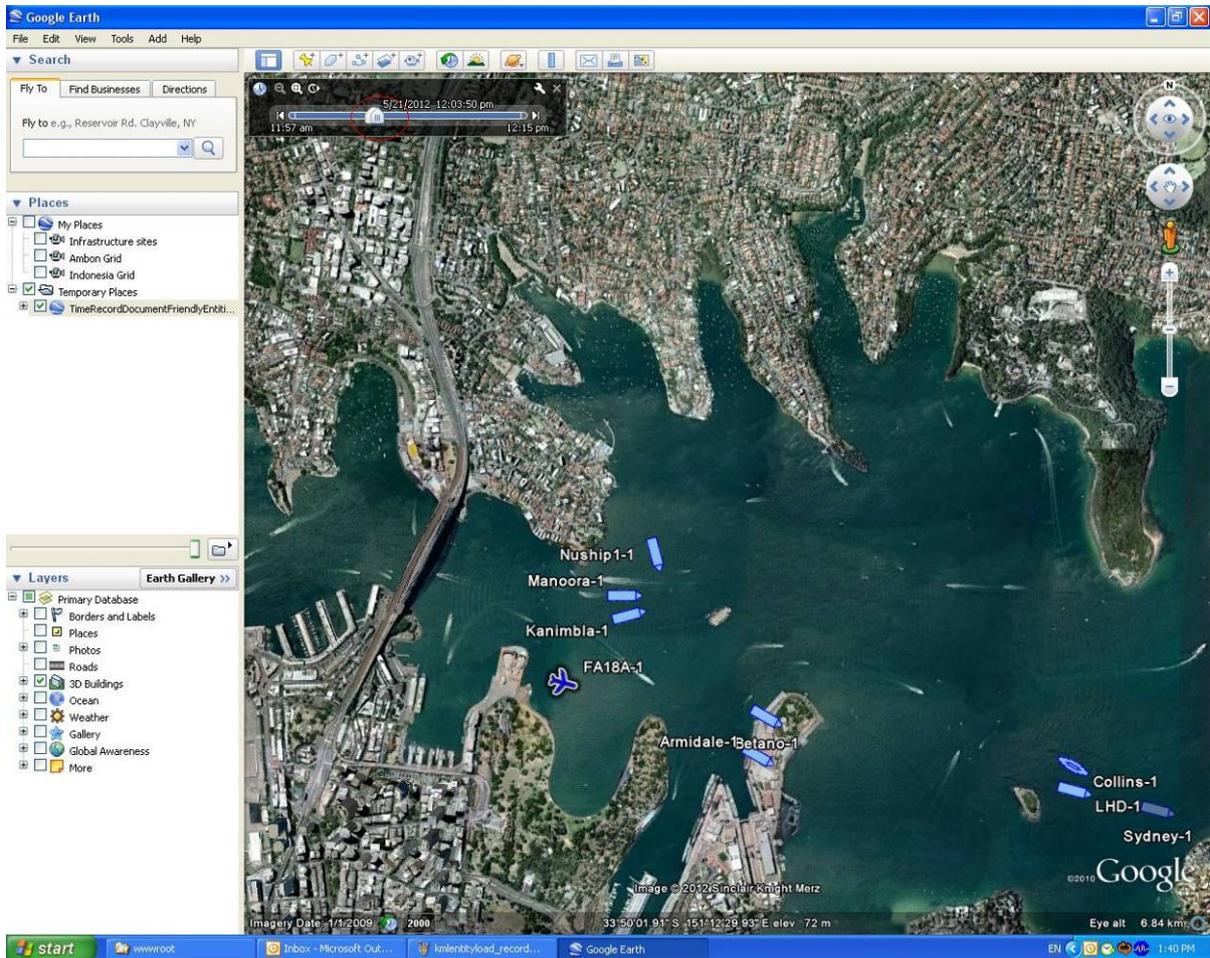


Figure 61 Using time slider to advance/reverse KML record

The speed of the animation and other options can be set by opening the options dialog by clicking on wrench icon that is located on the animation time controller.

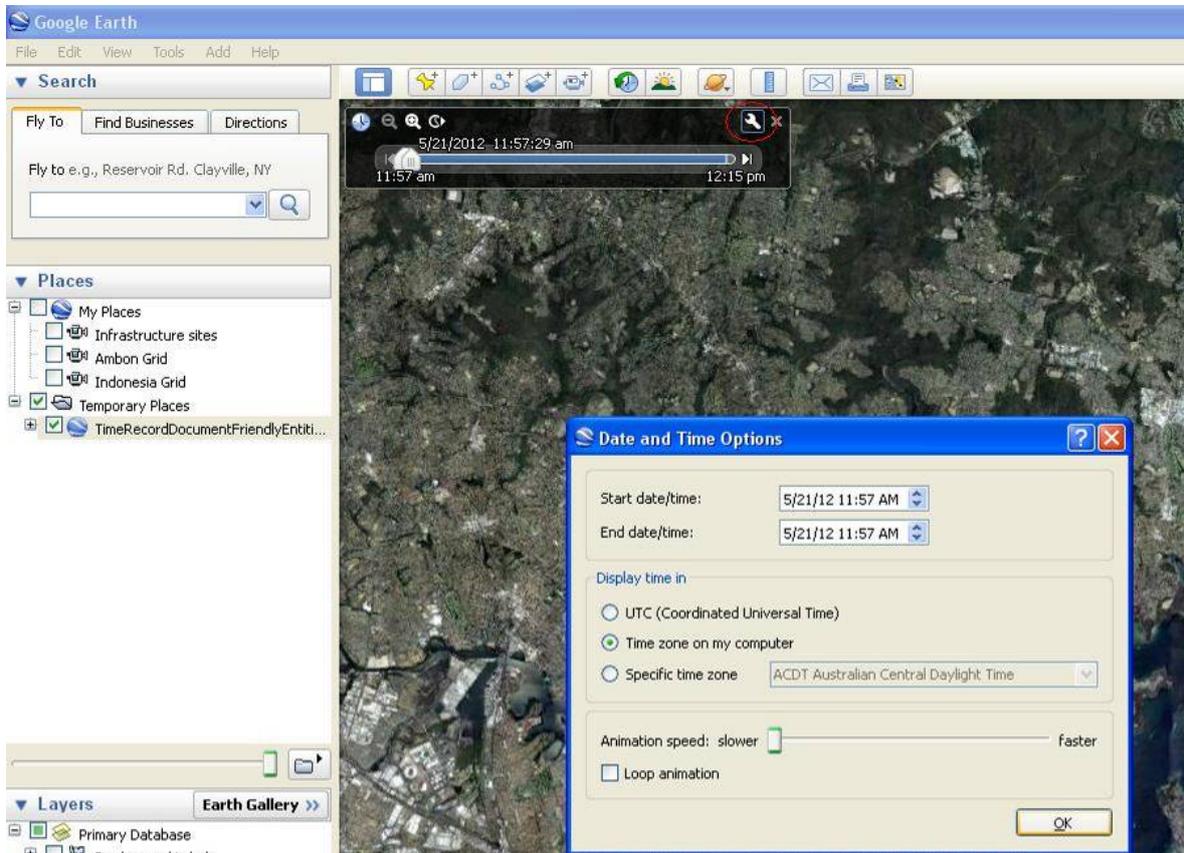


Figure 62 Setting Speed of KML replay

If a game has been recorded with detections, multiple Time Record files can be opened at once to replay the entire game. There will be six files to be opened; one for each forces entities and one for each forces detections (Friendly, Opposing and Neutral). This can be used to replay the white, blue or red views of the game or any combination, to help with analysis.

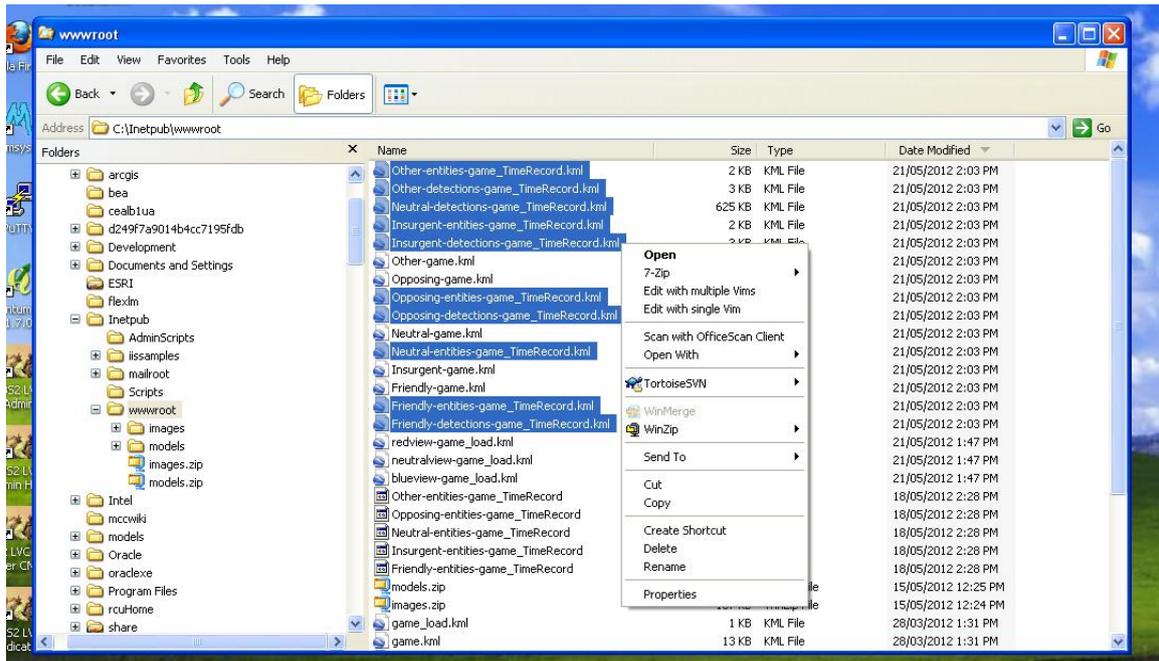


Figure 63 Loading all KML recorded files

The files could be opened on a remote machine with Google Earth by opening <http://hostmachine/filename.kml> in a web browser (tested using chrome), providing it can get a name resolution to the host machine. The files will load every recorded instance. The recording needs to be reset to the beginning by deselecting and selecting the Temporary Places Folder.

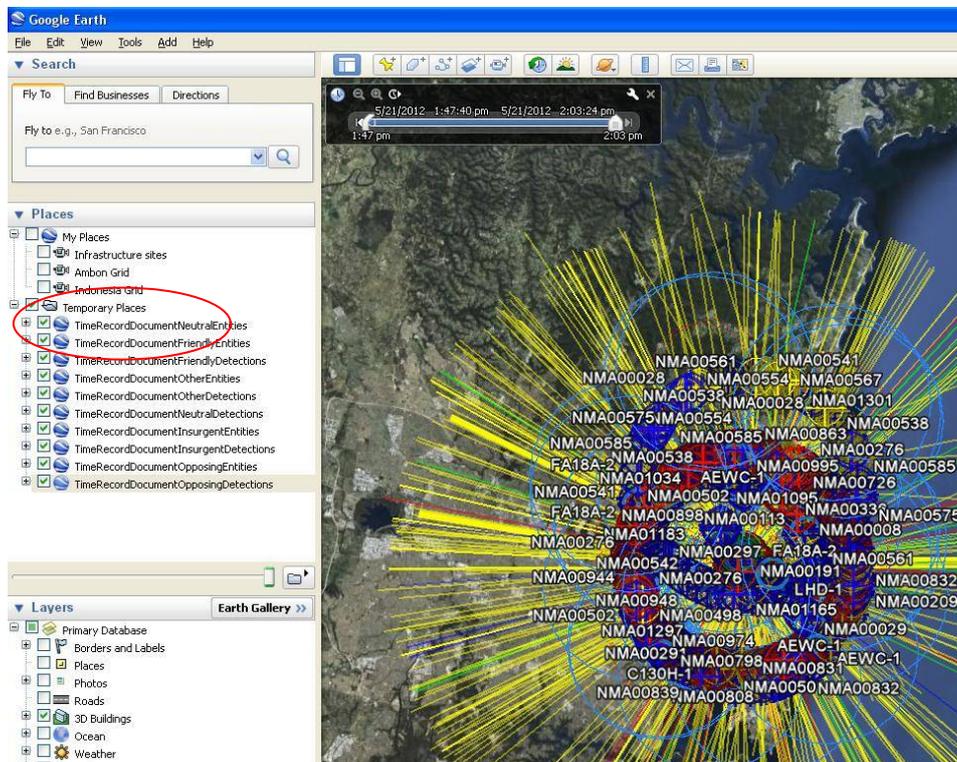


Figure 64 Google Earth all KML recorded files Open

The Time recording can be played by selecting the play button on the time slider.

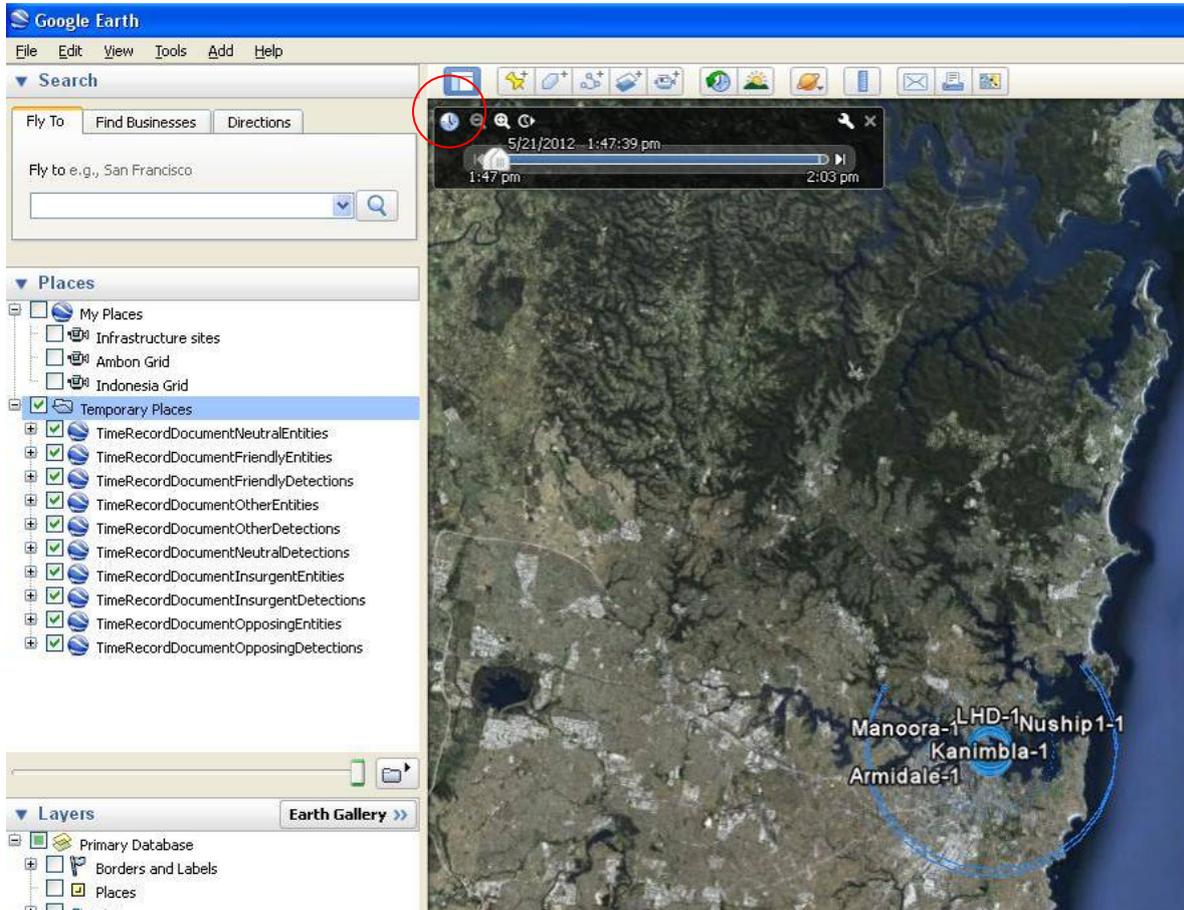


Figure 65 Google Earth Selecting Play for KML Recorded File

The recording can be played or the slider can be used to go to a specific time during the recording. Detections, entities, range rings can be deselected in the TimeRecordDocuments located in the side bar by finding the specific entry you want to not be displayed such as a specific entity, range ring or detection or deselecting a group such as deselecting all Friendly detections or entities.

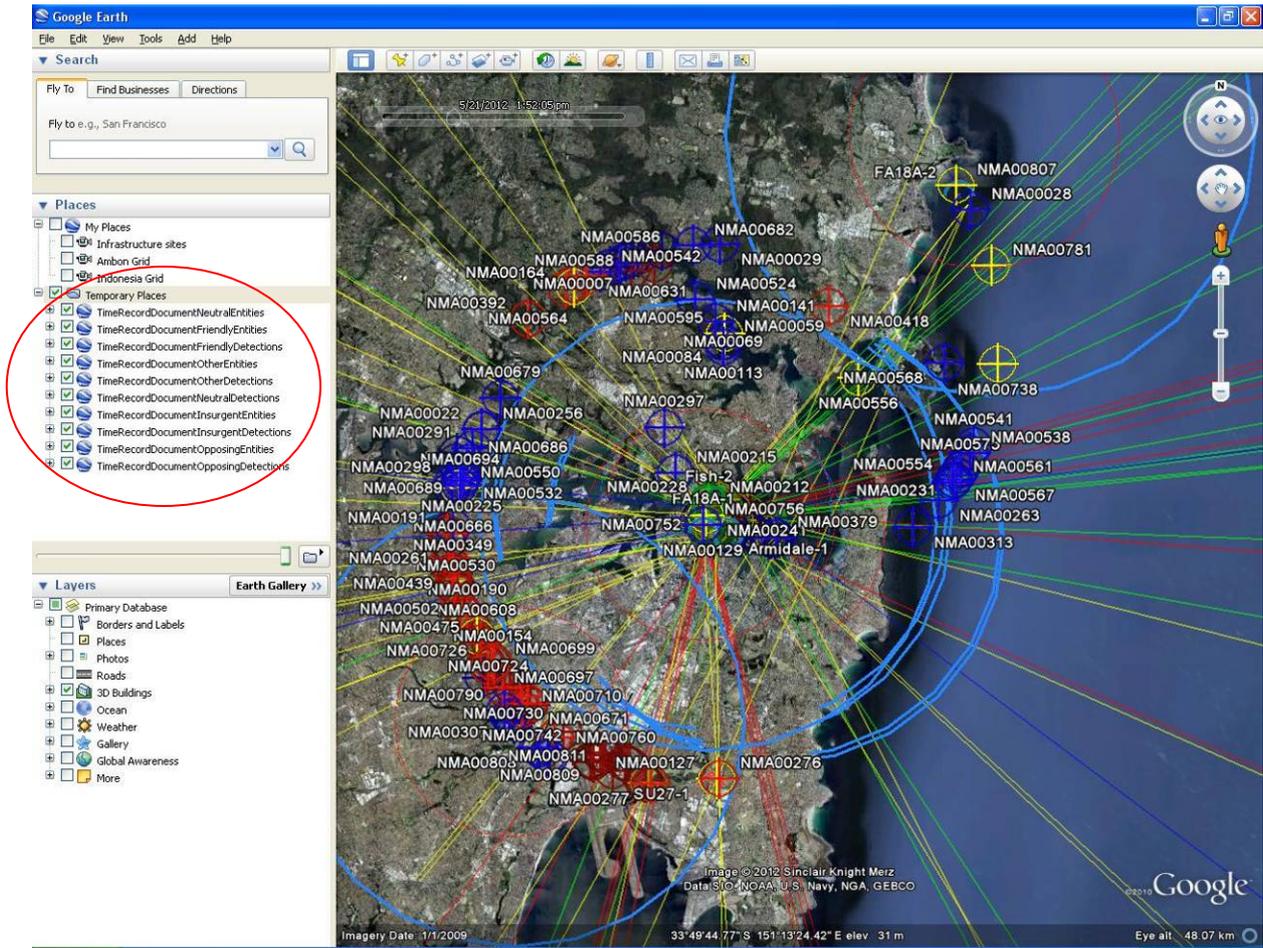


Figure 66 Google showing a complete recorded simulation

14.3 Merging Data

Google Earth can be used to merge data from the internet such as AIS ship tracks or satellite data. This is achieved by loading a kmz file from a third party such as the one supplied by Marine Traffic website or the satelliteDatabase.kmz provided by Advanced Geospatial Intelligence (AGI).

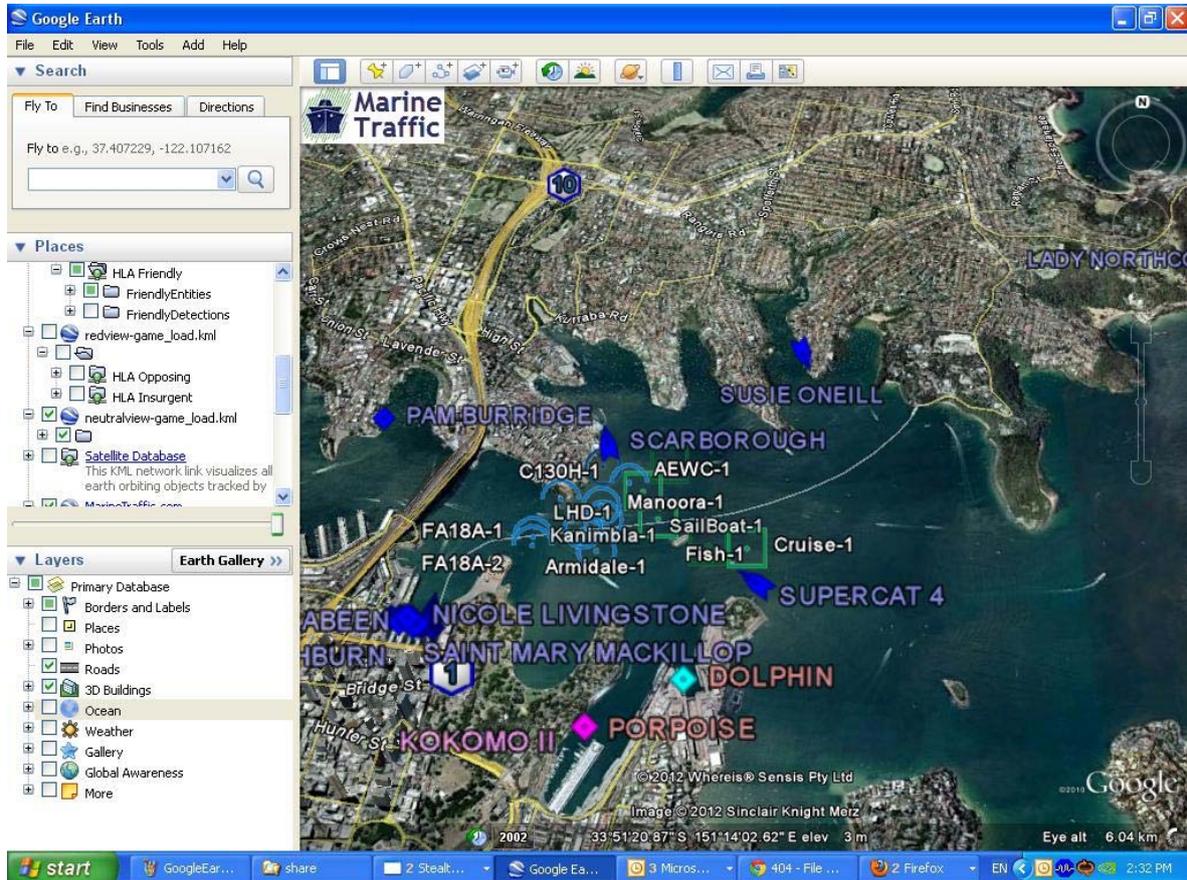


Figure 67 Google Earth Merging Simulation Data with Other Sources (Marine Traffic)

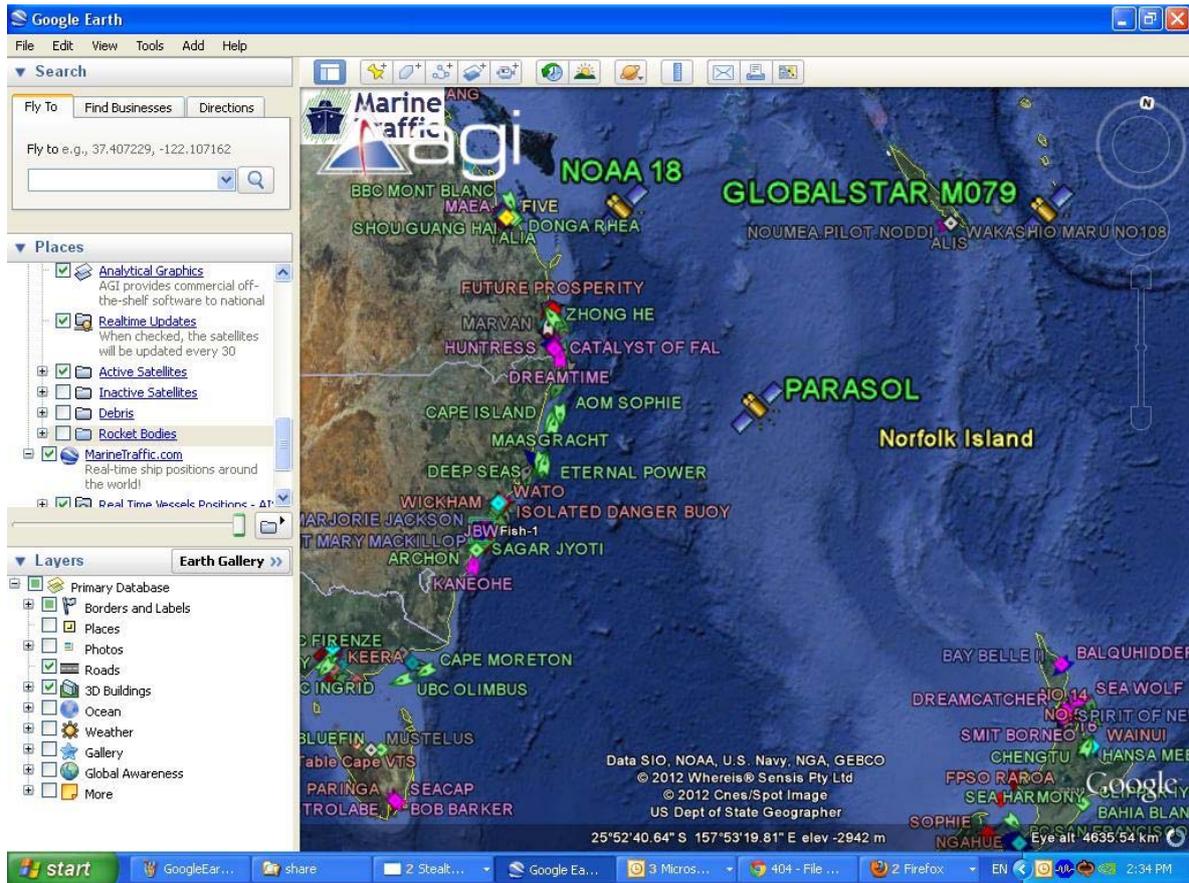


Figure 68 Google Earth Merging Simulation Data with Other Sources (Marine Traffic and Satellites)

15. KML Gateway in Model Mode

ADFStealthViewer can also be used to map HLA entities to 3D models displayed in Google Earth. Only static images can be produced as Google Earth does not handle moving models.

To enable this functionality, the entities to be represented need to be mapped to specific 3D models. If the viewing instance of Google Earth is on a machine other than the machine running the stealth viewer, the viewing machine should have the models in `c:\inetpub\wwwroot\models` copied to a `c:\models` directory and the following should be set in the `KMLEntityConfig.xml` file. Specific care should be taken on the circled items to enable best performance.

```

<?xml version="1.0" encoding="utf-8"?>
<!--KMLEntityUpdater Config File-->
<KMLConfig>
  <OS>Windows</OS>
  <OSVersion>XP</OSVersion>
  <WebServer>IIS</WebServer>
  <KMLServerName>cealhw2</KMLServerName>
  <KMLMediaServerName>cealhw2</KMLMediaServerName>
  <KMLFileName>game.kml</KMLFileName>
  <KMLFileFlushRate>1</KMLFileFlushRate>
  <KMLLoadFileName>game_load.kml</KMLLoadFileName>
  <KMLTimeRecordFileName>game_TimeRecord.kml</KMLTimeRecordFileName>
  <KMLRefreshRate>3.0</KMLRefreshRate>
  <KMLFileDirectory>C:\inetpub\wwwroot</KMLFileDirectory>
  <RecordingOn>false</RecordingOn>
  <TimeStampRecording>true</TimeStampRecording>
  <RecordRangeRings>true</RecordRangeRings>
  <RecordEntities>true</RecordEntities>
  <RecordDetections>true</RecordDetections>
  <EntityUpdateInterval>1</EntityUpdateInterval>
  <EntityRecordInterval>60</EntityRecordInterval>
  <BlipUpdateInterval>120</BlipUpdateInterval>
  <BlipRecordInterval>120</BlipRecordInterval>
  <NTDSIcons>false</NTDSIcons>
  <NTDSMaxDistanceLine>1000</NTDSMaxDistanceLine>
  <UseLocalModels>true</UseLocalModels>
</KMLConfig>

```

Figure 69 `KMLEntityConfig.xml` for Model Mode

The network connection is similar to before, except the resource file needs to have the correct Google models mapped to the HLA entities DIS enumeration.

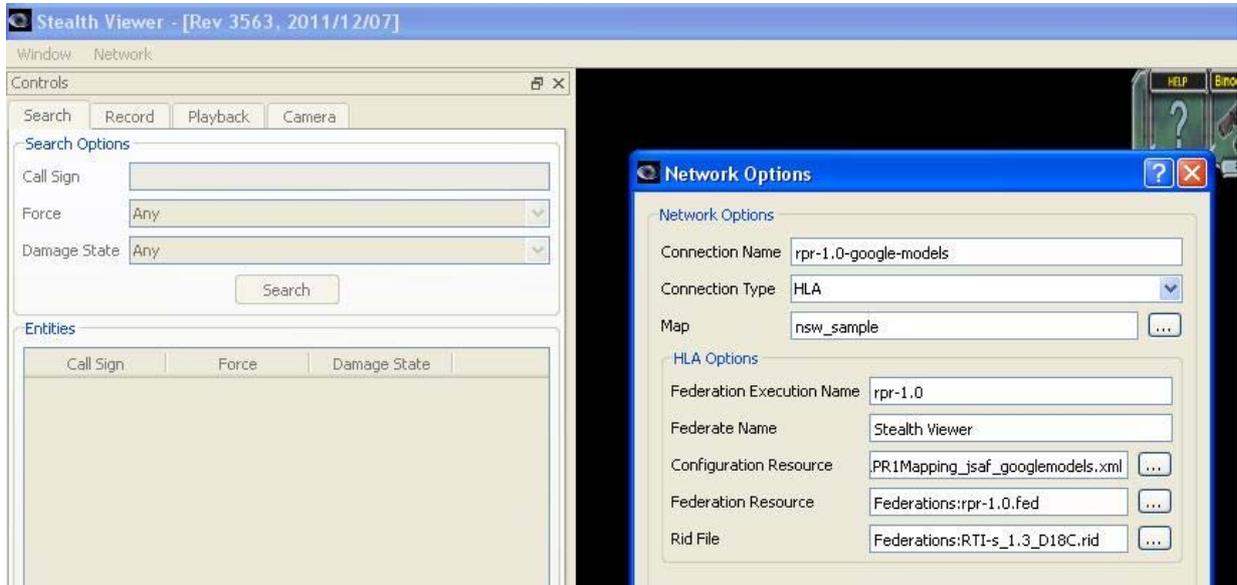


Figure 70 Network Options for KMLEntity in Model Mode

The configuration Resource selected should be RPR1Mapping_jsaf_googlemodels.xml.

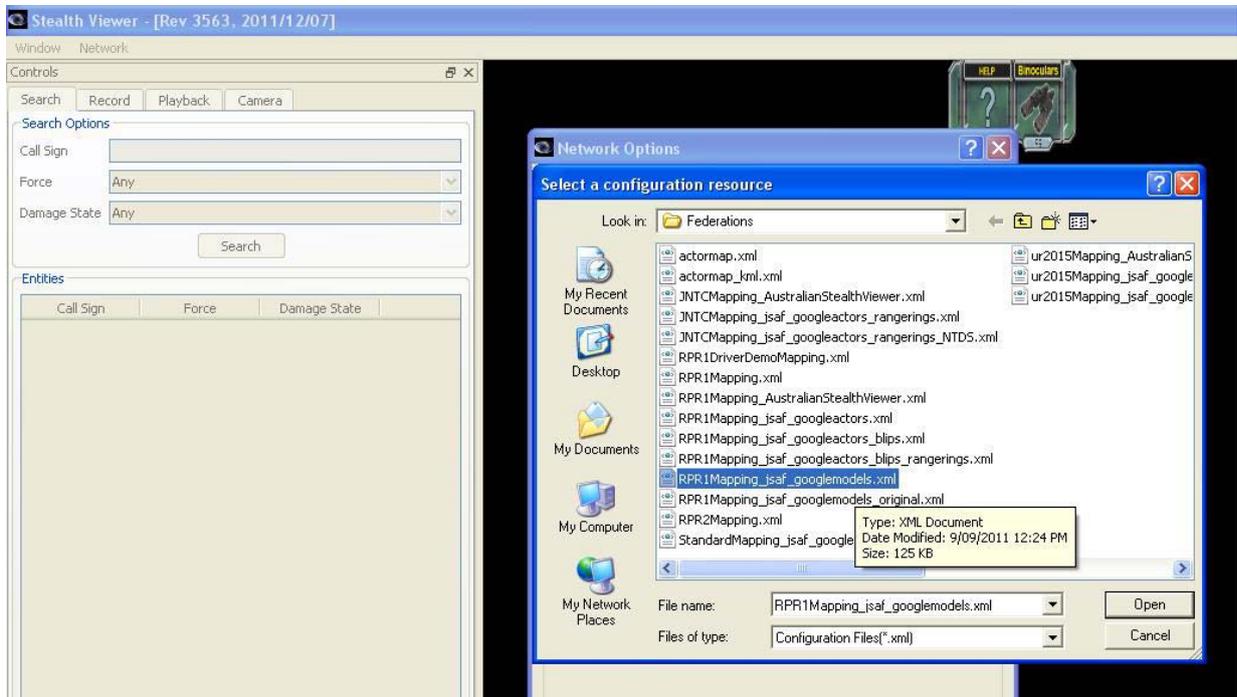


Figure 71 Configuration Resource Selection for KMLEntity Model Mode

If the connection works the following should be seen in Google Earth.

This scene, set in Auckland harbour, was generated using JSAF.

The Google Models were obtained from Google Warehouse or converted using Google Sketchup.

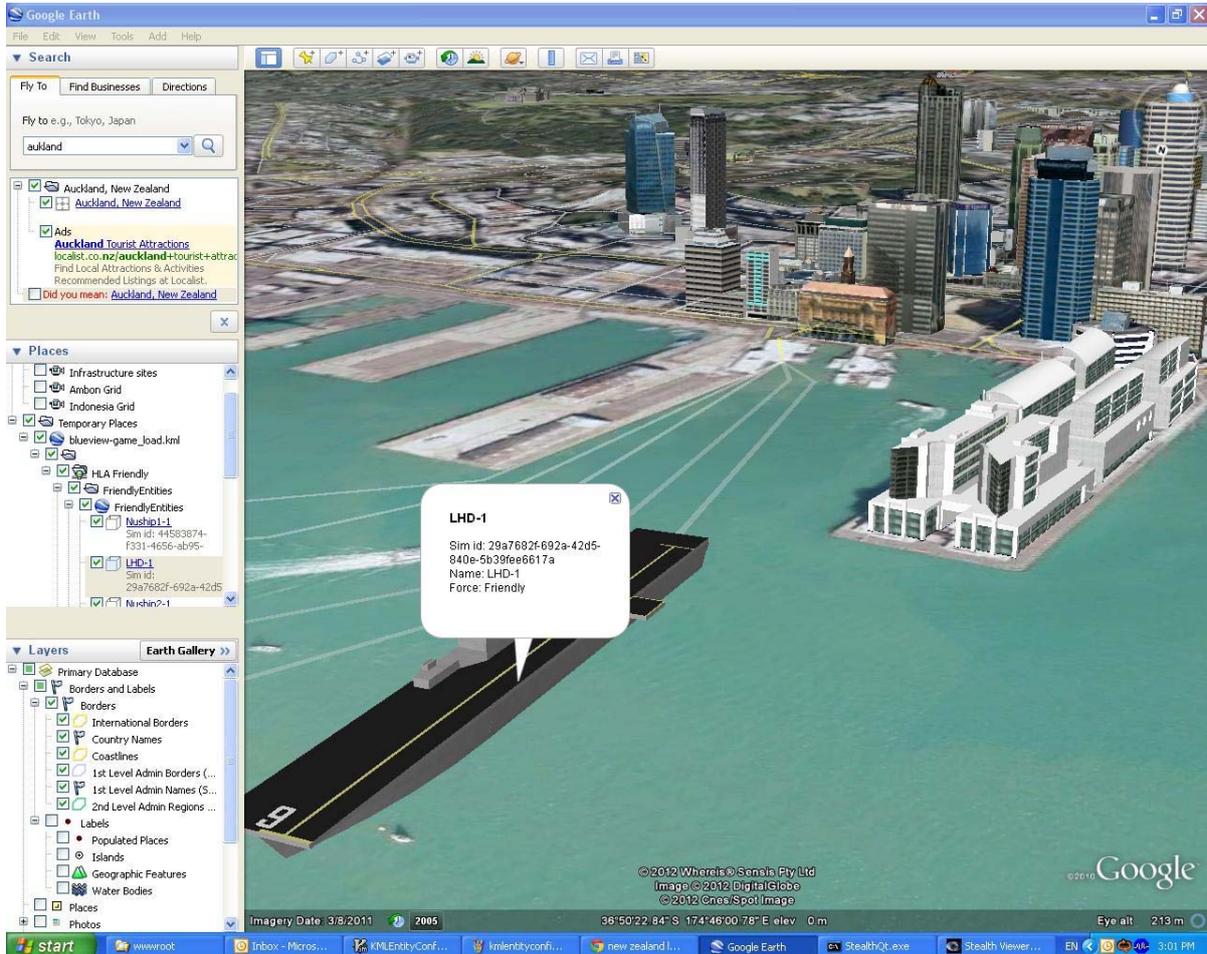


Figure 72 Google Earth displaying Simulation Entities in Model Mode (Auckland – New Zealand)

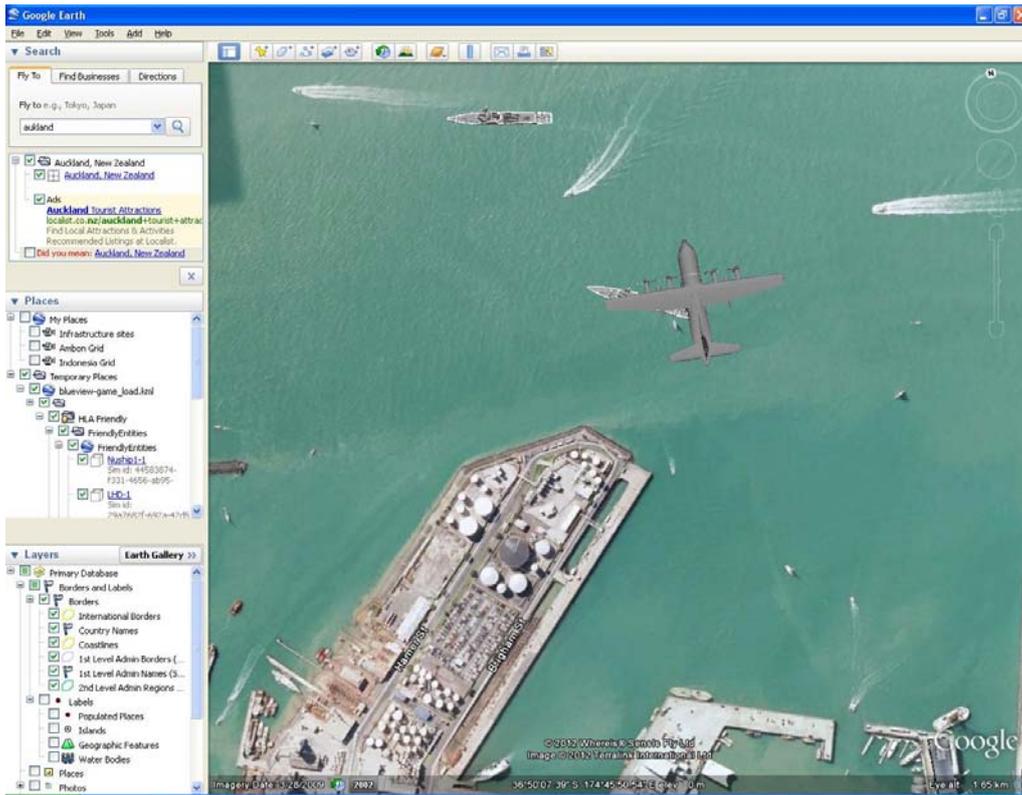


Figure 73 Google Earth displaying Simulated Aircraft Model (Auckland – New Zealand)

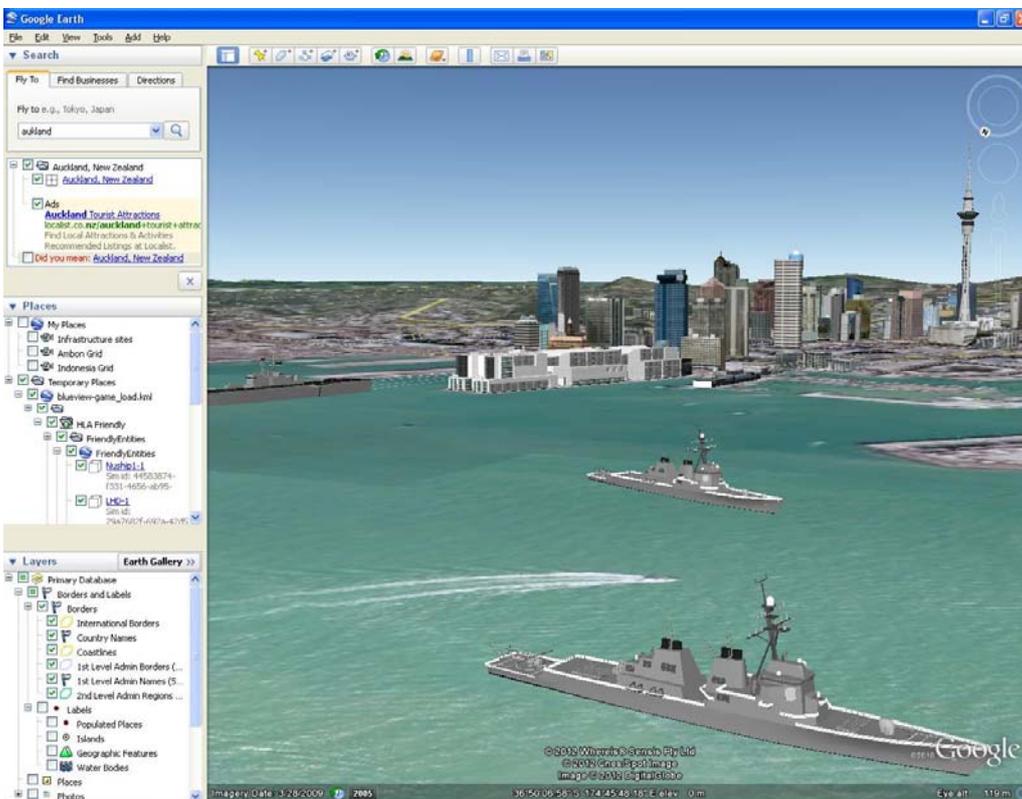


Figure 74 Google Earth displaying Simulated Ship Models (Auckland – New Zealand)

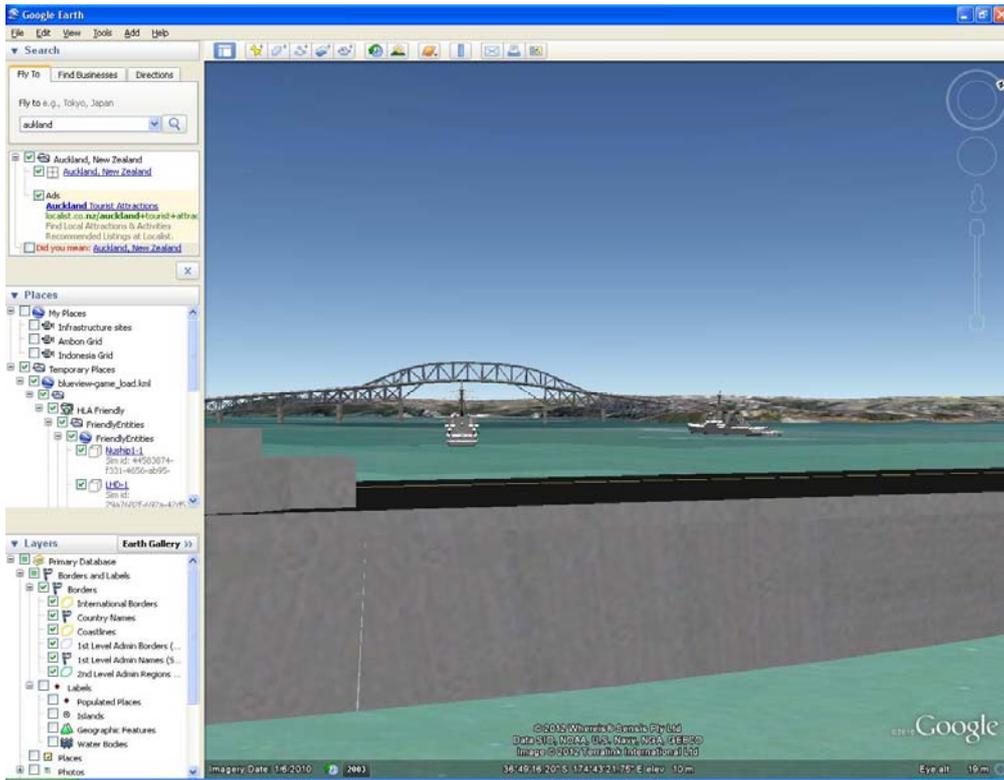


Figure 75 Google Earth displaying Simulated Ship Models and Bridge (Auckland – New Zealand)

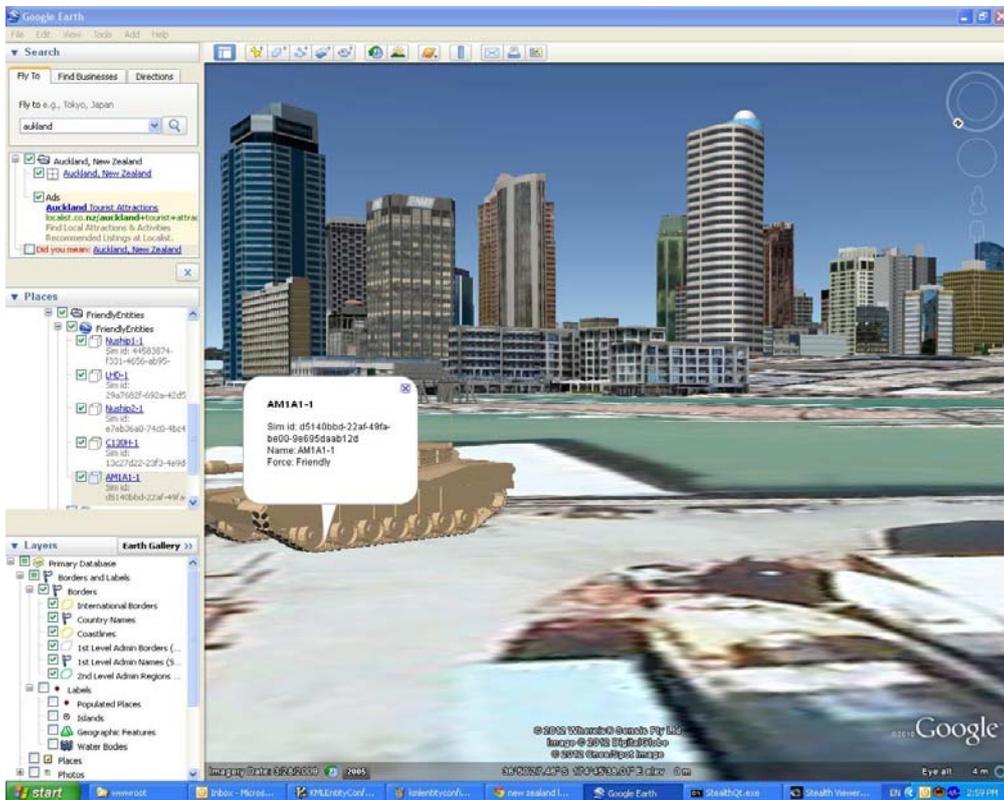


Figure 76 Google Earth displaying Simulated Tank Models (Auckland – New Zealand)

If models do not appear, a check should be made that they loaded properly into Google Earth.

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15.1 Multiple Screens in Google Earth

Google Earth has the ability to display a scene over multiple machines/screens. A central machine takes control of other machines. Google Earth instance and views can be offset from the original. To see the simulated entities each machine must open the corresponding kml file; the central machine is then used to control and synchronize the views.

The following shows a Central, Left and Right view of various scenes generated by the ADFStealthViewer.



Figure 77 3 Screen display of Auckland Harbour

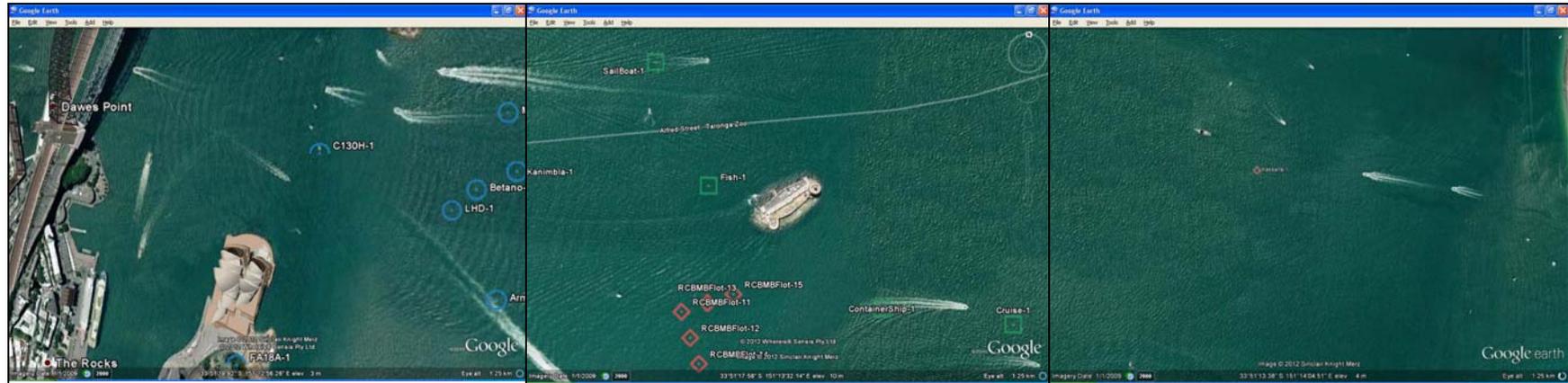


Figure 80 NTDS icons Sydney Harbour

16. 3D Models

The 3D Models are mapped to DIS enumeration in the simulation. This mapping is provided by the configuration resource file RPR1Mapping_AustralianStealthViewer.xml. Most Australian entities and several Kamarian entities have been mapped. To add more mappings follow the format in the file shown below.

The most important parts of the mapping consist of:

- The unique DIS enumeration.
- The class of Object
(BaseEntity.PhysicalEntity.Platform.SubmersibleVessel or BaseEntity.PhysicalEntity.Platform.Aircraft or BaseEntity.PhysicalEntity.Platform.SurfaceVessel or BaseEntity.PhysicalEntity.Platform.GroundVehicle).
- The 3D model to represent the vehicle in the Non-Damaged, Damaged and Destroyed states.

The following is an example of the Australian Collins class of submarine mappings.

```
<!--Australian SubmersibleVessel-->
<object extends="SubmersibleVessel" name="S71Collins">
  <objectClass>BaseEntity.PhysicalEntity.Platform.SubmersibleVessel</objectClass>
  <actorType>Entity.PlatformWithPhysics</actorType>
  <remoteOnly>true</remoteOnly>
  <disEntityEnum>
    <kind>1</kind>
    <domain>4</domain>
    <country>13</country>
    <category>4</category>
    <subcategory>1</subcategory>
    <specific>1</specific>
    <extra>0</extra>
  </disEntityEnum>
  <attrToProps>
    <gameName>EntityType</gameName>
    <gameDataType>STRING</gameDataType>
    <!--<default>HMMWVDrivingSim</default>-->
    <default>S71Collins</default>
  </attrToProps>
  <attrToProps>
    <gameName>SOUND_EFFECT_VEHICLE_LOOP</gameName>
    <gameDataType>Sounds</gameDataType>
    <default>Sounds:Vehicle_Idle.wav</default>
  </attrToProps>
  <attrToProps>
    <gameName>Non-damaged actor</gameName>
    <gameDataType>StaticMeshes</gameDataType>
<default>StaticMeshes:ADFModelRepository:ADF:Subsurface:collins_class:collins_class.ive</default>
  </attrToProps>
  <attrToProps>
    <gameName>Damaged actor</gameName>
    <gameDataType>StaticMeshes</gameDataType>
<default>StaticMeshes:ADFModelRepository:ADF:Subsurface:collins_class:collins_class.ive</default>
  </attrToProps>
  <attrToProps>
    <gameName>Destroyed actor</gameName>
    <gameDataType>StaticMeshes</gameDataType>
```

```

<default>StaticMeshes:ADFModelRepository:ADF:Subsurface:collins_class:collins_class.ive</default
t>
  </attrToProp>
  <attrToProp>
    <gameName>VehiclesSeatConfigActorNameTable</gameName>
    <gameDataType>STRING</gameDataType>
    <default>Vehicle_DD51_Config</default>
  </attrToProp>
  <attrToProp>
    <gameName>ShaderGroup</gameName>
    <gameDataType>STRING</gameDataType>
    <default>DDG51_ShaderGroup</default>
  </attrToProp>
  <attrToProp>
    <gameName>Ground Offset</gameName>
    <gameDataType>FLOAT</gameDataType>
    <default>0.0</default>
  </attrToProp>
  <attrToProp>
    <gameName>Munition Damage Table</gameName>
    <gameDataType>STRING</gameDataType>
    <default>DDG51</default>
  </attrToProp>
</object>

```

Another vehicle can inherit most things from an already defined vehicle making building up mappings quick and easy

```

<object extends="S71Collins" name="S72Farncomb">
  <objectClass>BaseEntity.PhysicalEntity.Platform.SubmersibleVessel</objectClass>
  <actorType>Entity.PlatformWithPhysics</actorType>
  <remoteOnly>true</remoteOnly>
  <disEntityEnum>
    <kind>1</kind>
    <domain>4</domain>
    <country>13</country>
    <category>4</category>
    <subcategory>1</subcategory>
    <specific>2</specific>
    <extra>0</extra>
  </disEntityEnum>
  <attrToProp>
    <gameName>EntityType</gameName>
    <gameDataType>STRING</gameDataType>
    <default>Farncomb</default>
  </attrToProp>
</object>

```

Note: If the mapping file is not consistent or has an error it will cause the simulation not to connect to the federation. An error in the command window may show the mistake. Care must be taken when editing this file.

There is a similar mapping file for DIS named "actormap.xml"

16.1 Viewing the 3D Models

A tool called ObjectViewer.exe is included with the ADFStealthViewer to enable viewing of the 3D Models. Select “All Programs > DSTO > ADFStealthViewer > ObjectViewer.exe” to start this program.

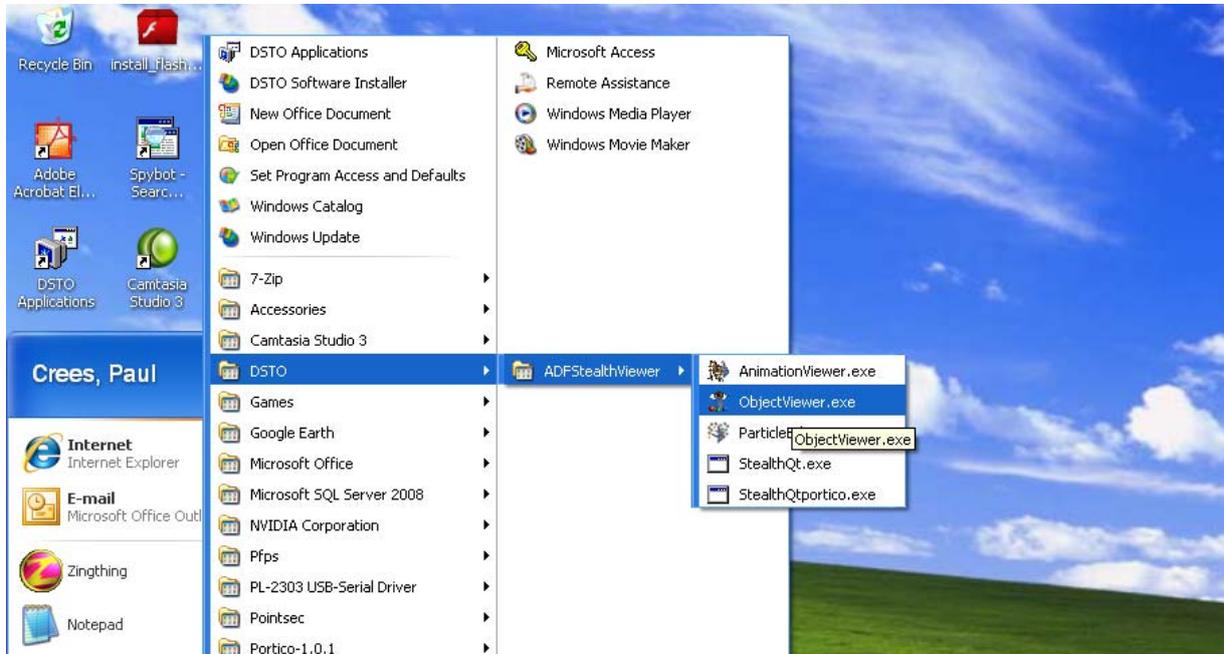


Figure 81 Launching ObjectViewer.exe

Geometry can be loaded by selecting “File > Load Geometry” and then navigating to and selecting the desired 3D model to load it.

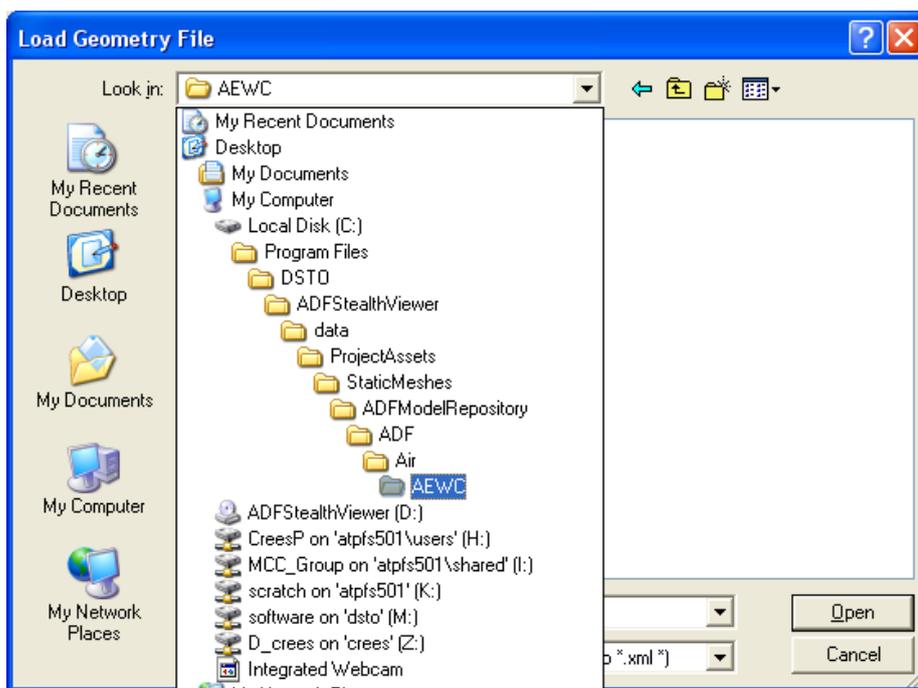


Figure 82 Open a Model File

The model is displayed and can be rotated or zoomed as required.

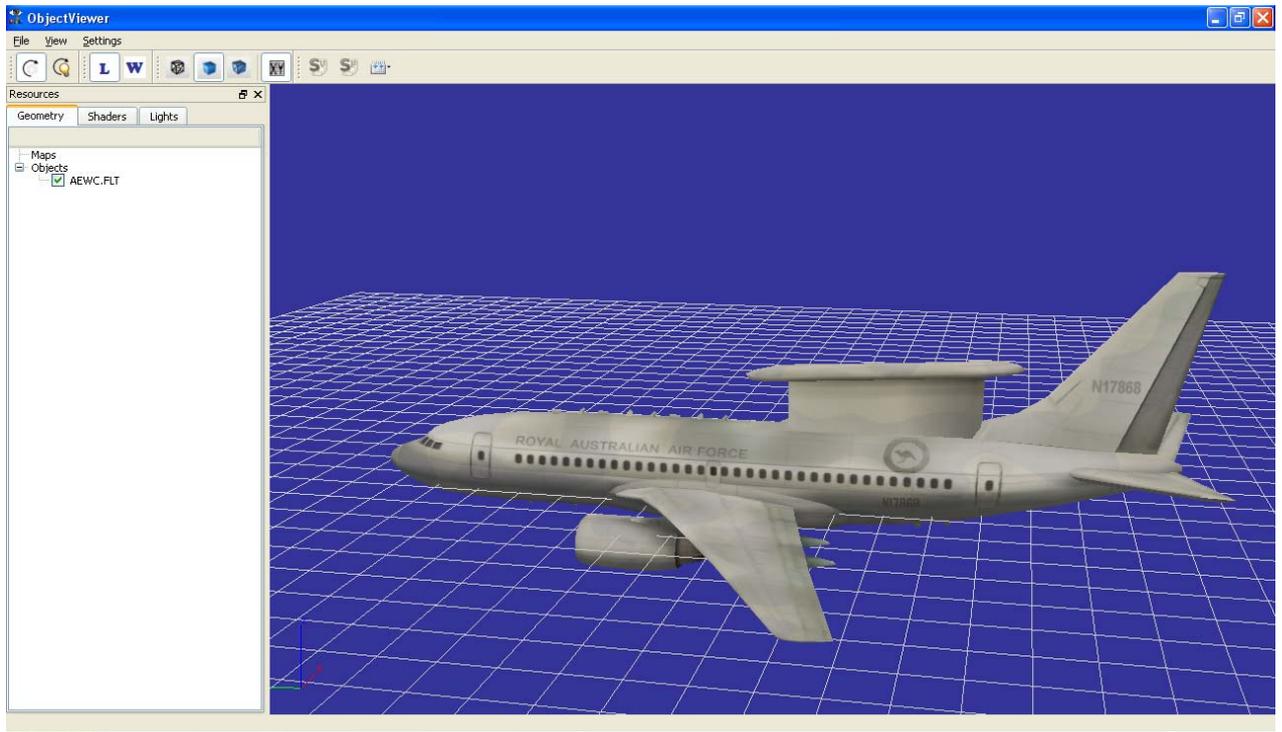


Figure 83 AEWC 3D model

17. Troubleshooting

17.1 Federates do not connect

Make sure the RID files used are identical on all simulations wishing to join a federation. This may mean making sure any RTI_RID_FILE environment variable is set to the RID file on the machine that you want selected (especially on a machine running JSAF).

17.2 Stealth screen does not appear

The config.xml file may not be set up correctly. This gets generated automatically but if the ProjectPath does not point to the ProjectAssets directory this usually causes errors. The config.xml file should also exist in the binary directory containing StealthQt.exe

17.3 Stealth does not connect to HLA

The mapping file may have an error. Look at any error messages in the command window and see if these can be fixed. A common error is that the XML is not formatted correctly (i.e. a start tag is missing an end tag or vice versa).

17.4 Model does not appear

Check there is a mapping in the RPR1Mapping_AustralianStealthViewer.xml file for the DIS enumeration. An error message will usually appear.

17.5 Terrain looks rough and flickers near shoreline

This is a near culling plane issue, the first part of the scene that the camera can view is too close to the camera. The picture below shows what happens when the near plane is set too close to the camera. Setting near plane to 5 or more should eliminate this problem.

Near Plane set to 0.05

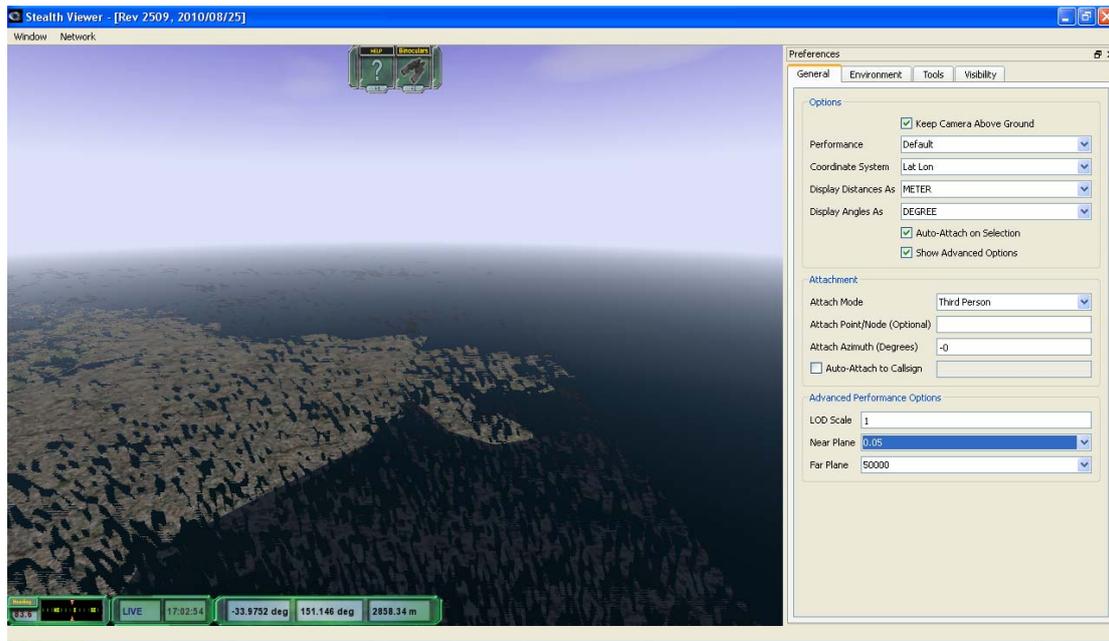


Figure 84 Flicker caused by Near Plane

Near Plane set to 5

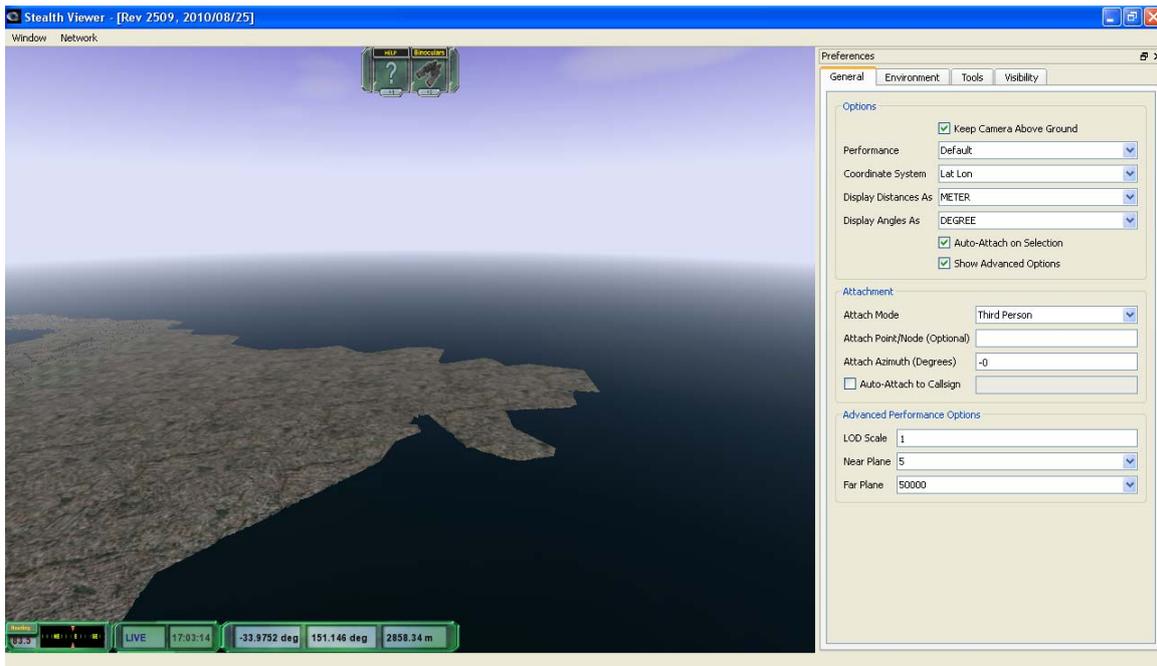


Figure 85 Near Plane setting removing Flicker

18. Future Work

The following is a list of areas of possible future investigation and work that could be undertaken to improve the ADFStealthViewer.

18.1 Linux

The Stealth Viewer can also be compiled for Linux machines. This could be fairly easily set up and a Linux version shipped along with JSAF.

18.2 GUI

The StealthViewer GUI should probably be modified to add things like an about page, Splash Screen, Help and contacts specific for the ADF.

18.3 Tools

The StealthViewer has other tools like GPS, Compass, Night Vision that can be added and need to be investigated further. Night Vision needs new models developed.

18.4 Terrain

The terrain built to date has some issues. These include but are not limited to the following:

1. The building heights are wrong. The tool had trouble generating these.
2. Islands sometimes are coloured blue not white and cannot be seen.
3. When inland areas dip below sea level flooding occurs.

A more detailed analysis of the issues was supplied by BAE on completion of the contract.

Also more correlated terrain in areas of interest should be developed.

18.4.1 Weather

The ADFStealthViewer can modify the weather such as cloud cover and visibility. The different Cloud Cover that can be set includes:

```
static CloudType CIRRUS;  
static CloudType CIRROCUMULUS;  
static CloudType CIRROSTRATUS;  
static CloudType ALTOCUMULUS;  
static CloudType ALTOSTRATUS;  
static CloudType NIMBOSTRATUS;  
static CloudType STRATOCUMULUS;  
static CloudType STRATUS;  
static CloudType CUMULUS;  
static CloudType CUMULONIMBUS;  
static CloudType CLEAR;
```

Visibility refers more to how far can be seen. There is also the ability to modify precipitation type, as shown by the following variables.

```
Static PrecipitationType UNKNOWN;  
static PrecipitationType NONE;  
static PrecipitationType RAIN;  
static PrecipitationType SNOW;  
static PrecipitationType FREEZING_RAIN;  
static PrecipitationType SLEET;  
static PrecipitationType HAIL;  
static PrecipitationType GRAUPEL;  
static PrecipitationType OTHER;
```

Most of the capability to represent weather is still being incorporated and needs to be hard coded into a future build. The development team are refactoring the weather component currently and intend to have weather selectable in the environment Tab in the ADFStealthViewer.

18.5 Models

Not all Models are complete. There are several models that are representative in the ADFModelRepository located in the ADFStealthViewer\data\ProjectAssets\StaticMeshes\ADFMModelRepository installed with the ADFStealthviewer, but it needs updating.

An EXCEL file in the doc directory titled “ADF Orbat” details the mapping.

18.6 Animations

Models in ADFStealthViewer can be animated and have rotating helicopter blades, rolling tyres, moving turrets and walking people for example. These need to be created and tested.

18.7 Detonations

Detonation can be mapped as well as smoke plumes. This needs more investigation and the actual animations for detonations created.

18.8 Sound

All vehicles can have sound added to them, but this has not been fully investigated

18.9 VBS2

The use of ADFStealthViewer and VBS2 should be able to be undertaken when correlating terrain for VBS2 has been created. We have the project files for the Sydney and Umboi Island and creating a correlating terrain for VBS2 should not take too much money or time.

18.10 Portico

There seemed to be problems when using Portico as the Real Time Infrastructure (RTI). The RTI is the middleware that allows the HLA federates to connect. These problems included machines crashing when using the high detail terrain and portico not connecting the two

federates properly on some windows machines. These issues were not present in the JSAF based rti-s.

18.11 Licensing

All the models and terrain have been created for the Australian Defence Force and are defence owned. The models have come from AOD, ADSO and the Assistant Technology Manager (Electronic Product Modelling & Simulation) | Directorate of Navy Platform Systems Navy Strategic Command. There should be an info.txt file in each directory stating its origin.

The terrain was built by BAE under contract for the ADF. A more formalised licensing should be set up prior to distributing the ADFStealthViewer.

The other models in the StaticMeshes directory are part of the Delta3D library as well as the models in the Vehicles directory under ADFModelRepository.

18.12 Mapping

Only the entities in the chosen mapping will be displayed. The mappings for HLA connectivity are of the form

```
<remoteOnly>true</remoteOnly>
<disEntityEnum>
  <kind>1</kind>
  <domain>1</domain>
  <country>225</country>
  <category>1</category>
  <subcategory>1</subcategory>
  <specific>2</specific>
  <extra>0</extra>
</disEntityEnum>
<attrToProps>
  <gameName>EntityType</gameName>
  <gameDataType>STRING</gameDataType>
  <default>Tank</default>
</attrToProps>
<attrToProps>
  <gameName>SOUND_EFFECT_VEHICLE_LOOP</gameName>
  <gameDataType>Sounds</gameDataType>
  <default>Sounds:Vehicle_Idle.wav</default>
</attrToProps>
<attrToProps>
  <gameName>Non-damaged actor</gameName>
  <gameDataType>StaticMeshes</gameDataType>
  <default>StaticMeshes:ADFModelRepository:ADF:Ground:M1A1:M1.FLT</default>
</attrToProps>
<attrToProps>
  <gameName>Damaged actor</gameName>
  <gameDataType>StaticMeshes</gameDataType>
  <default>StaticMeshes:ADFModelRepository:ADF:Ground:M1A1:M1.FLT</default>
</attrToProps>
<attrToProps>
  <gameName>Destroyed actor</gameName>
  <gameDataType>StaticMeshes</gameDataType>
  <default>StaticMeshes:ADFModelRepository:ADF:Ground:M1A1:M1.FLT</default>
</attrToProps>
<attrToProps>
  <gameName>Ground Offset</gameName>
  <gameDataType>FLOAT</gameDataType>
  <default>0.0</default>
</attrToProps>
<attrToProps>
  <gameName>Munition Damage Table</gameName>
```

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```

    <gameDataType>STRING</gameDataType>
    <default>DriverVehicle</default>
  </attrToProps>
</object>

<object extends="M1A1" name="M1A1AUS">
  <objectClass>BaseEntity.PhysicalEntity.Platform.GroundVehicle</objectClass>
  <actorType>Entity.PlatformWithPhysics</actorType>
  <remoteOnly>true</remoteOnly>
  <disEntityEnum>
    <kind>1</kind>
    <domain>1</domain>
    <country>13</country>
    <category>1</category>
    <subcategory>1</subcategory>
    <specific>0</specific>
    <extra>0</extra>
  </disEntityEnum>
</object>

```

Similar entries can be found in the actorMap files for DIS mappings.

A unique entry needs to be created for every DIS enumeration. However, they can extend a previously created entity like the M1A1AUS. An error will show up in the stealth viewer command window when the entity is added to the simulation that describes how no mapping was found for that particular DIS enumeration.

Mapping also needs to be done for all the possible detonations. This is done in the MunitionTypesMap.xml file. A default detonation could be created to allow all explosion to be shown in all cases, currently if it is not mapped it will not appear.

Appendix B: Licensing

B.1 ADFStealthViewer

ADFStealthViewer can only be supplied to employees within the Australian Defence Organisation (ADO).

The ADFStealthViewer is built using open source products which have the licensing arrangements given in the following sections.

B.2 Delta3D

The majority of the ADFStealthViewer is based on Delta3D (<http://delta3d.org>)

“Delta3D is released under the [GNU Lesser General Public License \(LGPL\)](#). The underlying modules may have their own licensing, but are at the minimum, considered Open Source and are freely distributable.”

B.3 Libkml

The Keyhole Mark-up Language (KML) connectivity is based on libkml (<http://code.google.com/p/libkml/>)

This is released under the new Berkeley Software Distribution (BSD) license (<http://opensource.org/licenses/BSD-3-Clause>).

B.4 3D models Licensing

Several 3D models included with ADFStealthViewer were built by groups within the ADO, the Australian Defence Simulation Office (ADSO), the Defence Science and Technology Organisation (DSTO) or the Australian Navy and are only releasable to the ADO. All models should have an info.txt file or variant i.e. “modelname”info.txt that describes where they were obtained from.

Some models were released with Delta3D under the same license as Delta3D.

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19. ABSTRACT The ADFStealthViewer User Manual details how to install, configure and use the ADFStealthViewer software. The software is based on an open source simulation and gaming engine stealth viewer application. Stealth viewers enable users to view a simulation event as a passive 'stealth' observer. The stealth viewer displays simulation entities with a 3D model representation in a 3D virtual world. The software allows basic features such as the ability to fly anywhere and look anywhere; configure networks and maps; connect to and disconnect from a network; set user preferences; entity search and attach behaviours.					