Simson Fennikel – user manual

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English summary

The Norwegian navy will procure five new frigates within 2010. The first frigate, KNM Fridtjof Nansen, was delivered by Navantia in May 2006. The frigates are equipped with two sonars in addition to the Flash dipping sonar on the helicopter. The low frequency acoustic array, CAPTAS, is able to detect small, diesel electro submarines at tens of kilometres. The hull-mounted sonar, Spherion MRS2000, makes the frigate capable of detecting mines and incoming torpedoes as well as submarines.

Project 899 “Nansen-klasse fregatt, evaluering” has developed quick look analysis software for anti-submarine warfare (ASW) to be used on board the Norwegian Fridtjof Nansen class frigates. This software is called Simson Fennikel and will aid the evaluation of the actions during ASW exercises. This includes visualization of positioning and dynamics of the platforms involved, the settings and performance of the acoustic sensors. Data are presented in a geotactical display window, graphs and tables using one or two screens.

Our main objective with the development of Simson Fennikel is to aid debrief after an exercise. The software can contribute to get answers for the following questions:
- What interesting situations occurred during the exercise?
- Why did we make the decisions we did?
- What would have happened if we had made another decision?

The target group for the software is military personnel in the sonar group on board the frigates. Experience from cruises shows that the software is helpful in tactical debriefs and training of sonar operators. It is vital that the exercise participants have their actions fresh in mind, therefore it is important to run the Simson Fennikel debrief shortly after the exercise.

The software is based on Microsoft technology and run under Windows. Mandatory components are a database (MS SQL) for data storage and an application, Maria[1], to visualize data. To be able to utilize functionality for technical plots, Matlab[2] must be available. To be able to utilize functionality for simulation of sonar performance, Lybin[3] must be available.

This document describes in detail the installation and use of Simson Fennikel. The software is to be used by officers on board the Fridtjof Nansen class frigates and on-shore. FFI will use this software to be able to do analysis on data recorded on the frigates.

Sammendrag

Marinen anskaffer fem nye fregatter innen 2010. Den første, KNM Fridtjof Nansen, ble levert fra Navantia i mai 2006. Fregattene er utstyrt med to sonarer i tillegg til Flash dyppesonaren som skal monteres på et NH-90 helikopter. Den lavfrekvente aktive tauesonaren, CAPTAS, er i stand til å detektere små, diesel-elektriske undervannsbåter i kystnære farvann på flere titalls kilometers avstand. Den skrogmonterte multirollesonaren, Spherion MRS2000, kan detektere miner og innkommende torpedoer så vel som undervannsbåter.

Prosjektet *Nansen-klasse fregatt, evaluering* (P899) har blant annet som oppgave å levere et quick-look analyseverktøy til Marinen, kalt Simson Fennikel. Dette er basert på verktøyet utviklet i prosjekt Simson (P849). Programvaren som ble utviklet i P849, kalt Simson, er et analyseverktøy for å evaluere og simulere fregatters aktive sonarsystem, og ble overlevert KNM Tordenskjold i 2005 [4].

Målet med Simson Fennikel som nå ferdigstilles er å være til hjelp ved taktisk og mer teknisk debrief etter en øvelse. Programvaren kan bidra til å få svar på spørsmål som:
- Hva skjedde?
- Hvorfor tok vi avgjørelsene vi gjorde?
- Hva hadde skjedd hvis vi hadde tatt en annen avgjørelse?

Målgruppen for verktøyet er militært personell i sonargruppen ombord. Erfaringer og tilbakemeldinger fra tokt viser at verktøyet er svært nyttig ved gjennomgang av taktikk og opptrening av sonaroperatører etter en øvelse. Lærenytten viser seg å være høy når man kjører debrief kort tid etter øvelsen, da alle parter har øvelsesforløpet friskt i minne.

Simson Fennikel er basert på Microsoft teknologi og kjører under Windows. Programvaren trenger en database (MS SQL) og data vises i kart ved hjelp av Maria levert av Teleplan[1]. For å utnytte funksjonalitet for tekniske plott må Matlab[2] være tilgjengelig. For å utnytte funksjonalitet for simulering av sonarytelse må Lybin[3] være tilgjengelig. Simson Fennikel inneholder funksjonalitet relevant for quick-look analyse. Dette er blant annet visualisering av plattformenes posisjonsdata, innstillinger og ytelse for de akustiske sensorene, samt hendelser registrert automatisk eller manuelt i løpet av øvelsen.

Målet er at marinen selv skal kunne kjøre quick-look analys. For å få til dette vil FFI fortsette å vedlikeholde verktøyet, være med på tokt for erfaringsoverføring og bidra til å få opplæring i verktøyet inn som en naturlig del av sonarpersonellets utdanning. Funksjonalitet fra verktøyet vil gå inn i nye prosjekt hvor målet er å lage et verktøy for maritim taktisk analyse. På det nåværende tidspunkt ser dette ut til å bli et eget verktøy som vil ta inn data fra en rekke nye maritime plattformer samt muligens ta inn nye typer data.

Dette dokumentet er en brukermanual som beskriver alle funksjonene i Simson Fennikel.

Contents

1 Introduction

This chapter describes the history of Simson Fennikel, and the structure of this document.

1.1 Background

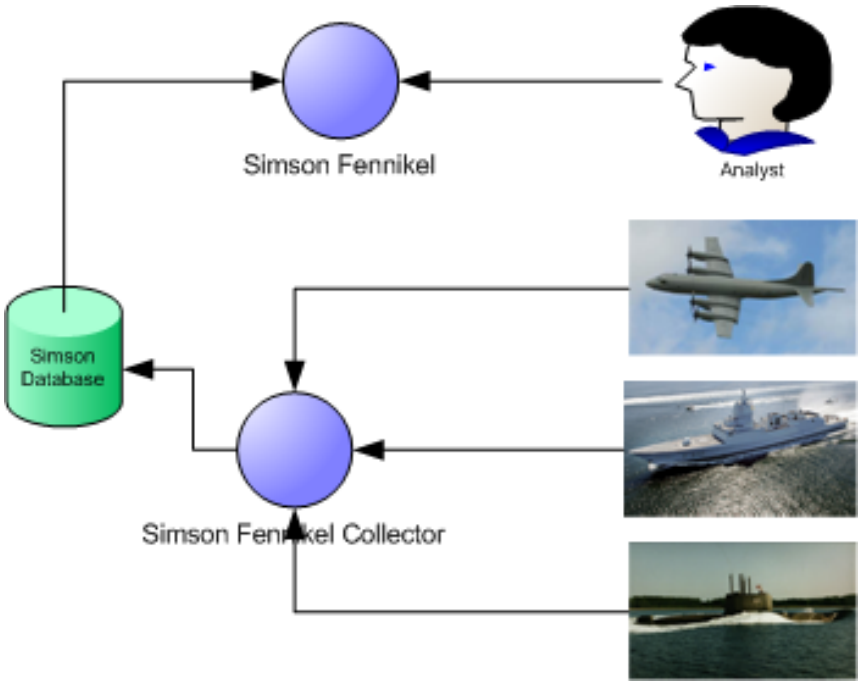


Figure 1.1 A diagram showing the collaboration between Simson Fennikel and Simson Fennikel Collector.

Project 899 “Nansen-klasse fregatt, evaluering” is to supply the navy with quick look analysis software, for anti -submarine warfare (ASW), by the end of 2008. The software is intended used on board the Norwegian Fridtjof Nansen class frigates. The analysis software, named Simson Fennikel, will aid in the evaluation of the actions during ASW exercises. The Simson Fennikel Collector (FC) application [5] will be used to handle recorded data, and store the relevant data in a Simson database. The data in the database is in turn accessed by Simson Fennikel, see Figure 1.1.

Simson Fennikel is a version of the Simson ASW analysis software [6] with quick look relevant functionalities. This includes visualization of positioning and dynamics of the platforms involved, the settings and performance of the acoustic sensors, and the events noted automatically or manually during the exercises. Data are presented in a geotactical display window, graphs or tables using one or two screens. Simson Fennikel can be a valuable asset in debrief of crew after ASW exercises.

Both Simson Fennikel and FC will be installed on board the Norwegian Fridtjof Nansen class frigates and used by naval officers. This user manual is intended to help these users to use Simson Fennikel to do quick look analysis after ASW exercises.

The name of the application Simson Fennikel has the following explanation:

- The name Simson is derived from a project called Simson. The project aimed to develop a simulation and analysis software tool for the new “Fridtjof Nansen”-class’ sonars, hence the name Simson. Now Simson is synonym with ASW analysis software for the Norwegian Fridtjof Nansen class.
- The name Fennikel is derived from Fridtjof Nansen class Quick Look, or FNQL. Fennikel is the Norwegian name for the herb fennel. In medieval times fennel was used to keep away witchcraft and other evil things.

1.2 Target Audience

The target audience for this user manual is

- Officers on the ships.
- Teaching staff onshore.
- Personnel to be educated onshore.

We assume basic understanding of underwater acoustics and how the sonar on the frigates works. Some basic understanding of Matlab [2] is also assumed.

1.3 Document structure

The document is based on a user guide [6] for the version of Simson produced by project 849 SIMSON. This document is a user guide for Simson Fennikel, which reflects the functionality present in the quick-look version of Simson. It is also restructured and extended to better meet the needs of personnel outside FFI.

Figure 1.2 gives an overview of references to windows and functions that are described in this document.

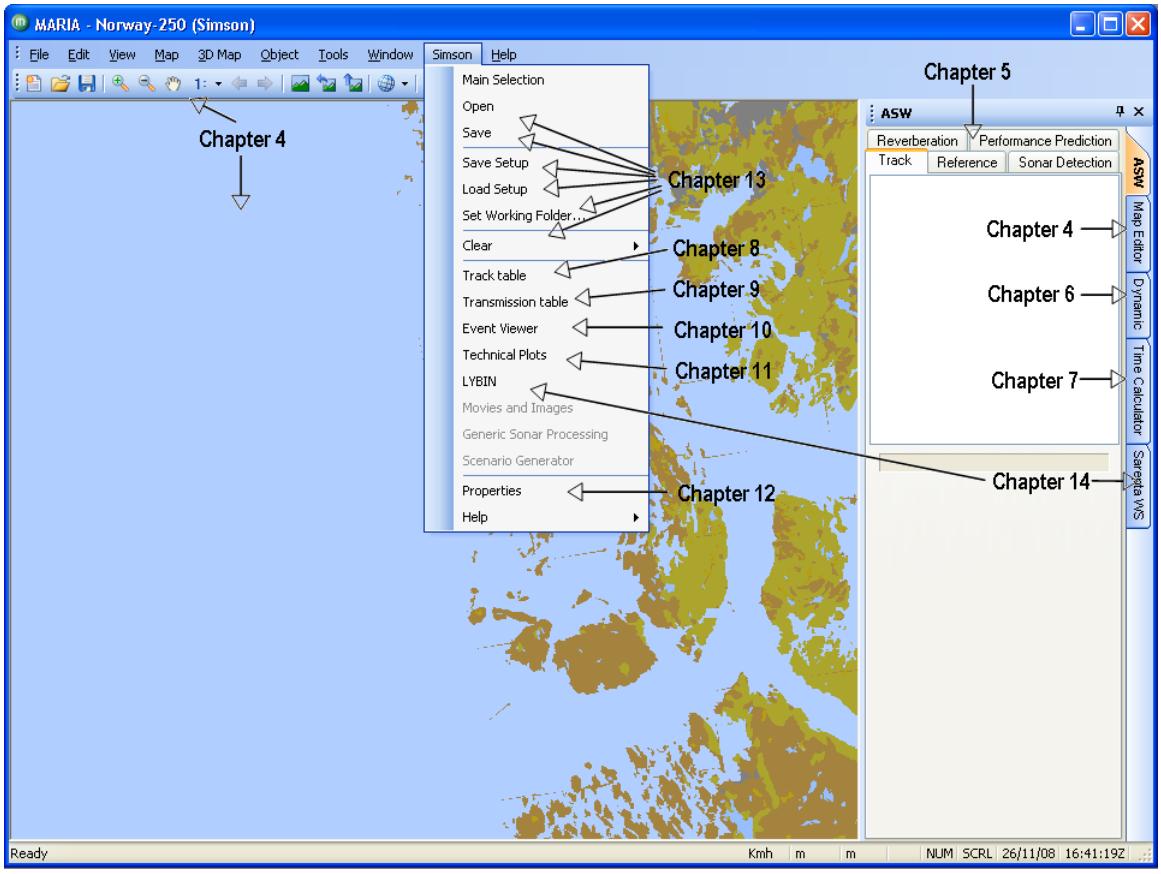


Figure 1.2 References to descriptions of windows and functions in this document

This document describes in detail the installation and use of the Simson Fennikel. A demo exercise will be used throughout the document to demonstrate functionality. Data from this demo exercise may not be representative for real exercises but is used here to keep the user manual unclassified.

- First the technical basis for the software is described in chapter 2. Hardware/software requirements and detailed installation instructions are given.
- Chapter 3 describes how to start up the Maria application and start selecting exercise data for analysis.
- Before the steps in the data analysis are described further, a brief introduction to key Maria functionality is given in chapter 4.
- Chapter 5 gives a detailed description of how to select various ASW data recorded from the exercise for analysis. This includes reference data, tracks, transmissions, reverberation and performance prediction data.
- Simson Fennikel gives the possibility to present data in dynamic mode, a concept called *dynamic playback*. It present data as an animation, and thus gives an opportunity to study time correlated events. The concept is introduced in chapter 6 and referred to in later chapters when the Simson menu is described.
- Chapter 7 describes the Time Calculator which converts a time frame to seconds and vice versa. This function may be especially handy when time-dependent plots are displayed with seconds on the x-axis.

- When data is selected, Simson Fennikel gives the possibility for detailed analysis by accessing various functions from the Simson menu. Chapter 8, 9 and 10 gives a description of the Simson menu's data tables named track table, transmission table and event viewer respectively. Various analysis functions can be accessed from these tables.
- Simson Fennikel makes use of Matlab to generate technical plots and to perform various calculations. Chapter 11 gives a detailed description of how to generate plots and how to manipulate these generated plots.
- The Simson menu has an option for changing properties for data visualization on a global level; this is described in detail in chapter 12. Some administrative functions are also available; these are described in chapter 13.
- Simson Fennikel makes use of the acoustic ray trace model LYBIN [3] to estimate sonar detection range and to aid understanding the acoustical conditions influencing sonar performance. Chapter 14 gives a description of how to start LYBIN calculations from Simson Fennikel.
- The document ends with two appendices; Appendix A gives more information on Technical plots generation and Appendix B gives a description of the columns in the Simson Fennikel tables for tracks and transmissions.

2 Requirements and installation

This chapter includes a requirement specification, of both hardware and software, and an installation procedure for the Simson Fennikel software and some of its prerequisites.

2.1 Hardware requirements

The requirements for hardware are divided into minimum requirements and recommended requirements. With the minimum requirements met, the user will be able to get a demonstration of the software. With the recommended requirements met, the user will be in a better position to do thorough analysis on large datasets.

The software architecture of Simson Fennikel benefits form multiple desktops being connected through a LAN. Analysis on the same datasets can be performed by multiple users at the same time. This solution includes a separate server hosting the Simson database. If the software is configured on a single PC, the requirements increase due to the hosting of the Simson database.

2.1.1 Minimum requirements

The minimum requirements take into account the installation of the Simson Fennikel software, Matlab, Maria with special maps and LYBIN.

CPU	Intel Pentium 4 @ 1 GHz or better
RAM	1.5 GB
Video	No specific requirements
Free space on HDD	6 GB

Table 2.1 Recommended hardware requirements

If the installation also includes the database, an additional 1.5GB RAM and 5 GB free space on the HDD must be included.

2.1.2 Recommended requirements

The recommended requirements take into account the installation of the Simson Fennikel software, Matlab, Maria with special maps and LYBIN.

CPU	Intel Pentium 4 @ 2.5 GHz or equal
RAM	4 GB
Video	2xDVI graphics card
Free space on HDD	15 GB

Table 2.2 Minimum hardware requirements

If the installation also includes the database, an additional 10 GB free space on the HDD must be included to allow growth of the database. The lack of additional RAM requirement, if database is

to be hosted, is due to the fact that ~4 GB of RAM is the maximum amount a 32-bit Microsoft Windows operating system can handle.

The software has yet to be tested on a 64-bit operating system, like the 64-bit versions of Windows XP or Vista. In theory all 32-bit applications, like those installed along Simson Fennikel, will be able to use 4 GB of RAM each in such a version.

2.2 Software prerequisites

Simson Fennikel is implemented in such a way that it utilizes third-party applications to extend its own functionality. Simson Fennikel has thus some software prerequisites.

Software	**Description**
Windows XP 32-bit	Operating system
Internet Information Services 5.1 or equal	Hosting the Sarepta Web Service. IIS comes with the Windows operating system.
Sarepta Web Service	The Web service and the database with bottom profiles
Teleplan MARIA 5.2	Teleplan Globe GIS application
FFI map collection	Detailed maps of the seabed (optional)
Matlab 7 or higher	Interactive environment for performing technical computing
LYBIN 5.0	Sonar performance prediction software
Microsoft SQL Server 2005	Database management software for hosting the Simson database
.Net 3.5 Framework	Program libraries for C#, service pack 1 or higher
vcredist_x86	Runtime components for Visual C++ 2008 Libraries

Table 2.3 Software prerequisites for Simson Fennikel

2.3 Configuring prerequisites for Simson Fennikel

Simson Fennikel is implemented in such a way that it utilizes third-party applications to extend its own functionality. These applications need some configuration adjustments to be optimized for Simson Fennikel. Thus the adjustments are explained as a part of the installation guide for Simson Fennikel.

For installation of the third-party applications, please refer to their respective installation guides.

2.3.1 Installing .Net 3.5 framework

The .Net 3.5 framework is included on the installation DVD [7] of Simson Fennikel. The installation file is called *dotnetfx35.exe*.

Without this framework installed, the Simson Fennikel software will not run.

2.3.2 Installing runtime components for Visual C++ 2008 Libraries

The runtime components for Visual C++ 2008 Libraries are included on the installation DVD [7] of Simson Fennikel. The installation file is called *VS2008vcredist_x86.exe*.

Without these libraries installed, Simson Fennikel will not be recognized as a Maria add-in.

2.3.3 Activate Matlab COM Automation server capabilities

The COM Automation server capabilities in Matlab have to be activated to be able to communicate with Matlab from Simson Fennikel.

By typing the following command in a Command prompt, the capabilities will be activated for that installation of Matlab.

```
<matlab installation folder>\bin\win32\MATLAB.exe /RegServer
```

On success, a Matlab Command Window should appear. And the following command in Matlab will confirm success if the result is 1 (true).

```
enableservice('AutomationServer', true)
```

If the enabling of the COM Automation server capabilities in Matlab was unsuccessful, please refer to the Matlab documentation or internet.

Without this installation installed, Simson Fennikel will not be able to use Matlab for displaying figures used in kinematic analysis.

2.3.4 Installing Internet Information Services with Sarepta Web Service

Sarepta Web Service is the bottom profile database. This functionality is used by several functionalities in Simson Fennikel involving sonar performance prediction. This installation can be installed on every computer running Simson Fennikel, or on a server on the LAN connecting the computers.

The Internet Information Services (IIS) are included as an optional component in most installations of Microsoft Windows. IIS is not installed by default, but may be added through the “Add/Remove Programs”-functionality in Windows. For more information concerning installation of ISS, please refer to Microsoft documentation and internet.

To be sure ISS is properly configured to the .Net framework, the following command needs to be executed in a Command prompt.

```
C:\WINDOWS\Microsoft.NET\Framework\v2.0.50727\aspnet_regiis.exe –i
```

If the execution fails, the most common error message is: *Fail to access IIS Metabase*, when trying to access the web site.

Sarepta Web Service files are located on 2 DVD's [8]. The installation procedure involves copying the folder *WSAMI-Sarepta-v2* from the DVD's to a location on HDD. Please note that the classification of these data is CONFIDENTIAL.

In the Internet information Services management snap-in tool, a reference to the Sarepta folder needs to be added as new virtual directory. The snap-in tool is found in *Control Panel: Administrative Tools*, and displayed in Figure 2.1.

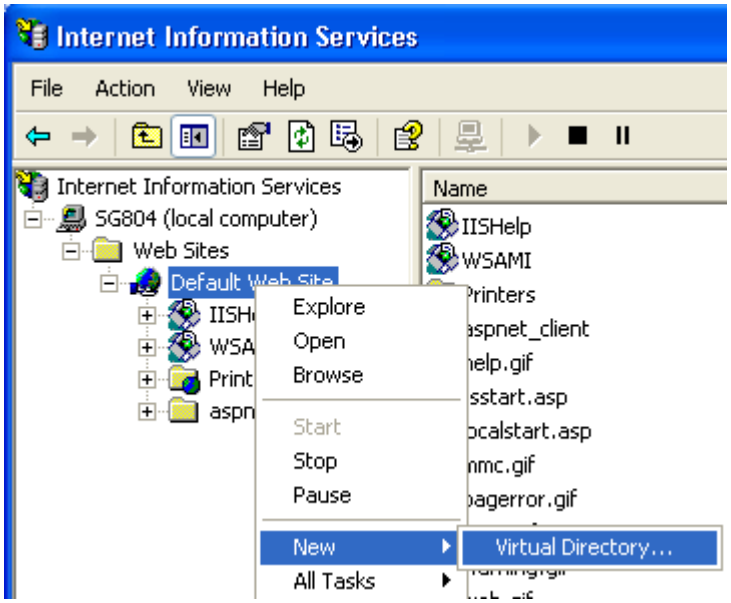


Figure 2.1 Internet information Services management snap-in tool. Sarepta must be added as a new virtual directory.

When following the wizard, it is important to set the alias for the virtual directory to ***Sarepta***. The access permission needs to be *Read* and *Run scripts*.

When the virtual folder is added to the default web site, the properties for the virtual directory need to be checked. Open the property window for Sarepta, and verify that the ASP.NET version used is 2.0.50727. If not, change to this version.

This completes the installation of the Sarepta Web Service. The service should now be available from a browser, by going to the address: http://localhost/Sarepta/NVRGservice.asmx

Without the Sarepta Web Service installed, some functionalities in Simson Fennikel will not be able to retrieve bottom profiles for sonar performance prediction.

2.3.5 Installing the FFI map collection

After having installed the Teleplan Maria application, it is necessary to add maps suited for ASW analysis. These maps include a detailed seabed at selected locations. Copy the map files to an easy accessible location, e.g. C:\FFImap. Please note that some maps have classification

CONFIDENTIAL and can be obtained from The Norwegian Military Geographic Service (FMGT).

2.3.6 Installing the Simson database

The Simson database is managed by the Microsoft SQL Server 2005 software. For installation of the software, please refer to the software documentation of that product. Typical installation type may be chosen, but with the *Windows Authentication* option selected.

Once installed, it is advisable to check the network configuration for SQL. Open the *Computer Management* application in *Control Panel: Administrative Tools*. Choose *Services and Applications: SQL Server Configuration Manager: SQL Server 2005 Network Configuration: Protocols for MSSQLSERVER.* Enable *Shared Memory*, *Named Pipes* and *TCP/IP*[1].

The Simson database files are located in the database folder on the Simson Fennikel installation DVD [7], and are named *Simson_v63.mdf* and *Simson_v63_log.ldf*. Copy these files to the local HDD. It is advisable, but not necessary, to copy the files to the default location for database files in Microsoft SQL Server 2005:

```
<drive> \Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Data
```

To get Microsoft SQL Server 2005 to manage the Simson database, it must be attached to the SQL server. For those new to this application, please follow the following steps. But keep in mind that Microsoft SQL Server 2005 is an extensive product, so please refer to documentation and internet for help.

- Open the application SQL Server Management Studio, included in the installation of Microsoft SQL Server 2005.
- Connect to a server type *Database Engine*, on server name *localhost*, and select authentication *Windows Authentication*
- Select on *Databases* from the tree view.
- Right-click and select *Attach...* Displayed in Figure 2.2.
- The appearing window includes an *Add*-button. Now add the *Simson_v63.mdf* to the server.
- Verify that both *Simson_v63.mdf* and *Simson_v63_log.ldf* are defined under database details. Then click OK.
- The next step is to set user rights. Depending on the computer security rights for the user running Simson Fennikel, the requirements for user rights in Microsoft SQL Server 2005 vary. For a single computer setting, make sure all Simson Fennikel users on the computer are defined in the *Security: Logins* on the SQL Server. Either by their single user, or a group.
- Their server roles should stay *public*, but their user mapping should include *Simson_v63*, with the roles *db_datareader* and *db_datawriter*, in addition to *public*.

[1] Enable TCP/IP if computer is connected to a network

- Their status should naturally be a grant in connection to the database engine, and an enabled login.
- To be able to execute stored procedures in the server, the database owner (dbo) of *Simson_v63* must permit the users to do so[2]. Enter the properties of the dbo schema in *Security* folder under the *Simson_v63* database.
- Select the *Permissions*, and add the Simson Fennikel users, or group. Check the *Grant*-option on the *Execute*-row. Click OK, and permission should be granted.

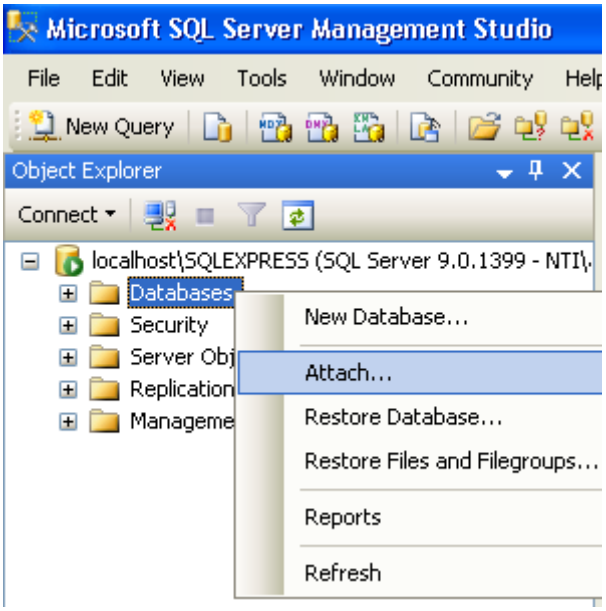


Figure 2.2 Databases is selected from tree view, and the context menu contains the option "Attach...". This will enable us to attach the empty Simson database from the Simson Fennikel installation DVD.

The installed database will be empty, and Simson Fennikel Collector [5;9] must be used to fill it with data.

Without the installation of the database, no data can be analyzed with Simson Fennikel.

2.4 Installing Simson Fennikel

The entry point to the Simson Fennikel software is through Teleplan Maria, as an add-in. The Simson Fennikel files are thus installed under the Teleplan Maria installation folder.

Copy the folder named Simson, from the Simson Fennikel installation DVD, to the Teleplan Maria program folder. In a typical installation of Teleplan Maria, the path for program folder is as follows.

```
C:\Program Files\Teleplan\MARIA5\Program
```

[2] This is due to how the permission of the Simson stored procedures were once programmed

Then copy the file *maria.exe.config* from the installation DVD to the same folder as above. Please note that the xml-format on this file may vary with different versions of Maria. Check that the format of the default configuration file is similar to the one on the installation DVD. If the files are not similar, copy text from the DVD version that is Simson specific to the default one.

The next step is to start Teleplan Maria application and add the Simson Fennikel add-in. Once the application has started, select *Tools: Addins*, from the menu bar as displayed in Figure 2.3.

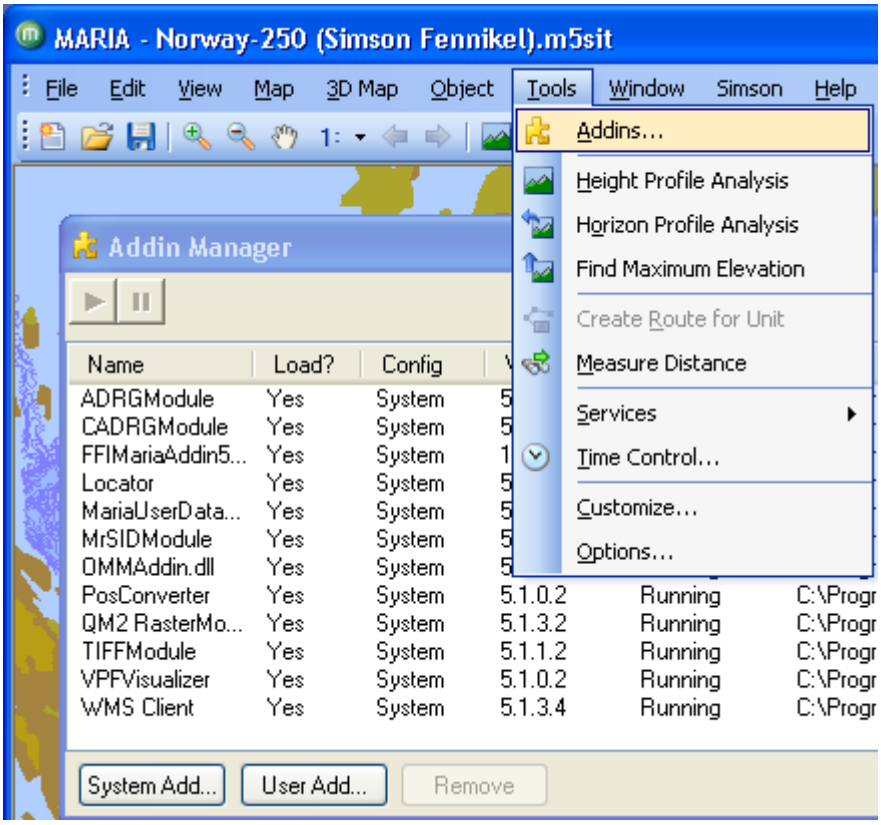


Figure 2.3 Screen shot of Teleplan Maria with the Tools-menu open. The resulting window of the Addins-option, called Addin Manager, is displayed in the background.

In the resulting window called *Addin Manager*, click the *System Add*-button. Browse to the file *FFIMariaAddin55.dll*, located in the bin-folder in the installation folder of Simson Fennikel. A full path of the file, for a typical installation, is given below.

```
C:\Program Files\Teleplan\MARIA5\Program\Simson\bin\FFIMariaAddin55.dll
```

Close and restart Teleplan Maria, and confirm that the menu option *Simson* is available in the menu bar, as seen in Figure 2.3.

The next step is to dock the data selection windows inside Teleplan Maria. Select the *View*-option from the menu bar. Select the Simson Fennikel windows that should be docked. Normally, the windows *ASW, Dynamic, Sarepta WS* and *Map Editor* are selected. Previous versions of Teleplan Maria, before version 5.2, needed an internal window to be displayed before add-in windows could be displayed. In that case the *Map Editor* is such a window.

Figure 2.4 displays the optional windows given by the *View* menu option. The windows check of in the list displayed are Simson Fennikel windows, except *Map Editor, Caption* and *Status Bar*, which are standard Teleplan Maria windows.

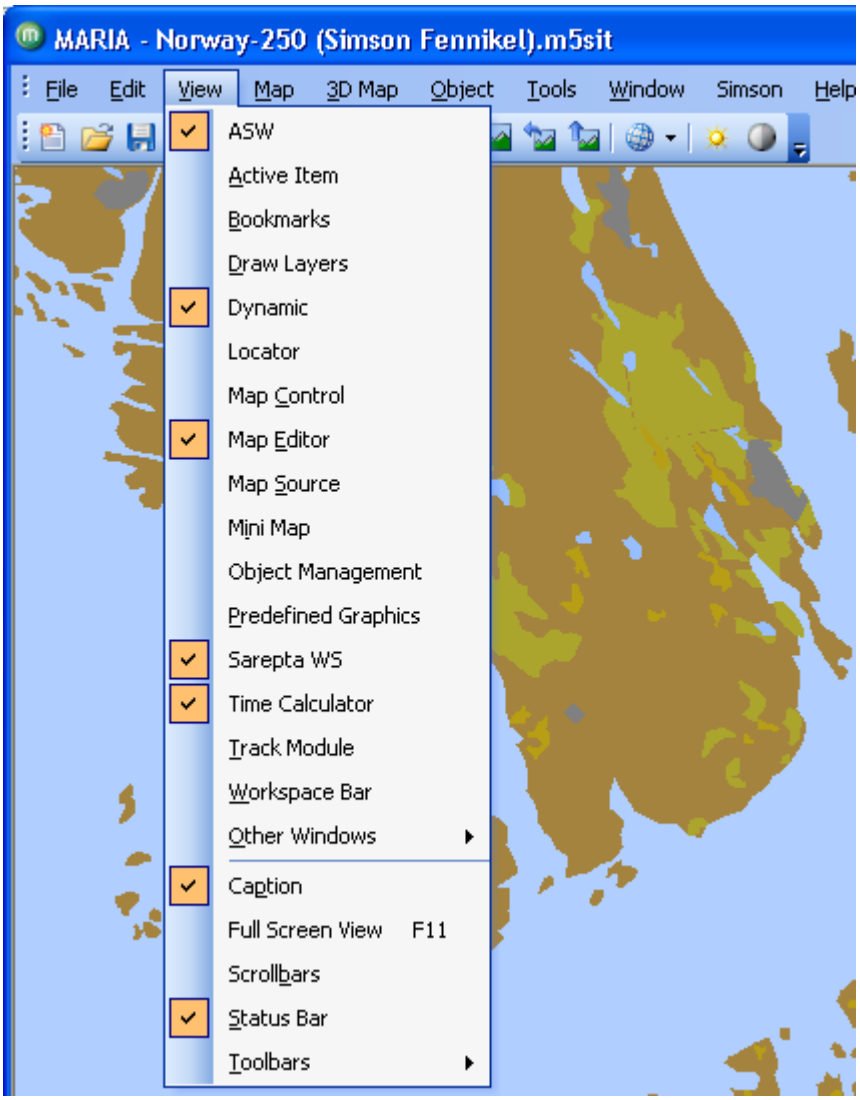


Figure 2.4 Selecting Simson Fennikel windows to dock inside Teleplan Maria

This completes the installation of Simson Fennikel.

2.5 Disabling the Simson Fennikel add-in in Teleplan Maria

To disable the Simson Fennikel add-in in Teleplan Maria, simply remove the add-in in *Addin Manager*. No files will be deleted, but Simson Fennikel will not be loaded in Teleplan Maria.

3 Getting started using Simson Fennikel

3.1 Starting Teleplan Maria

Start the Teleplan Maria application from the shortcut placed in the *Program* section of the Start menu:

Start → Programs → Teleplan Maria → Teleplan Maria 5

Please note that the application Matlab is automatically started when Maria is started. This application should not be closed. The layout of the Matlab window is initially the same as last time it was used (together with Simson Fennikel or as a standalone tool). If the Matlab window is covering the Maria application, minimize it by clicking the minimize button in the upper right corner.

Figure 3.1 shows the initial view which is displayed when the application is started.

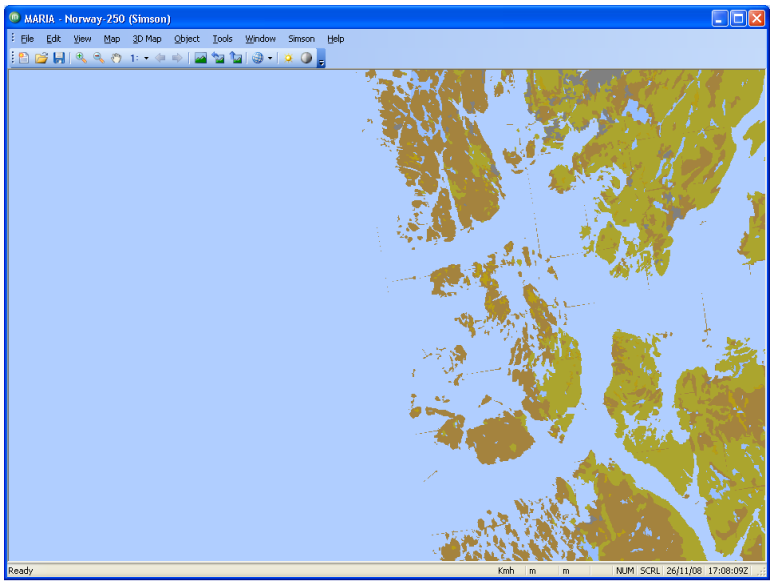


Figure 3.1 The Simson Fennikel initial view

If no map is displayed in the Simson Fennikel view, a map file has to be opened:

File → Open

Choose the folder where the maps are located, drill down to the templates folder and select the file of type “m5sit”.

To set this map as a default situation every time Maria is opened:

Map → Save Default Situation

The workspace window is per default loaded every time Maria is started. To avoid this:

Tools → Options → Miscellaneous → Uncheck "Load Workspace at startup"

Display the *ASW* window which is placed in the View menu on the top of the screen:

View → ASW

This window may be docked to one of the four sides in the Maria application. To dock a window, click on the window bar and hold while dragging the window to the arrow indicating docking position. Figure 3.2 shows the process of dragging the ASW analysis window from the left side to the right side.

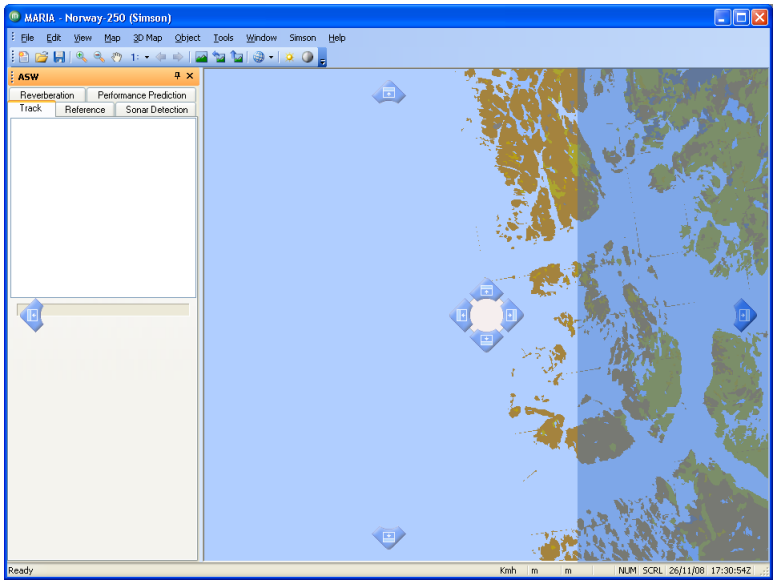


Figure 3.2 The docking possibilities for the ASW analysis window

In Figure 3.3 the *ASW* window has been docked to the right. Maria remembers where windows are docked and placed, so they only have to be docked once.

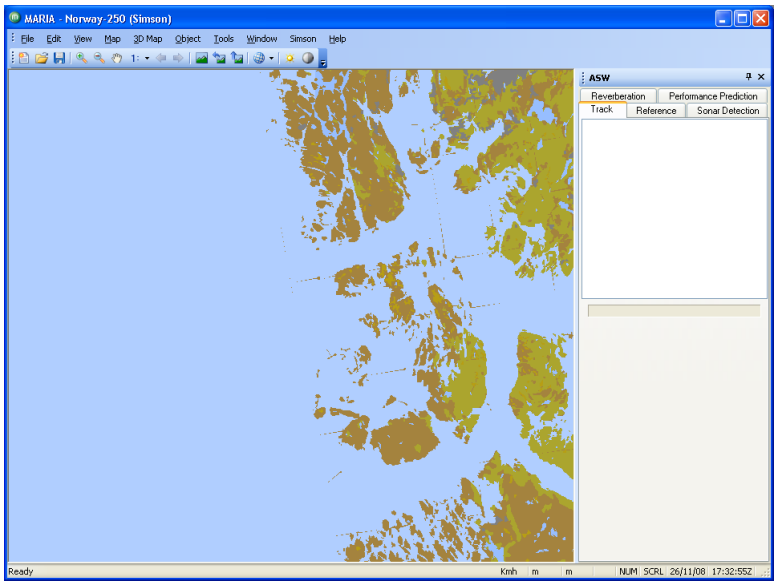


Figure 3.3 The ASW window docked to the right

3.2 Selecting data for ASW analysis

In the Simson menu, click the *Main Selection*-option to open the windows for main data selection. Figure 3.4 shows where to find the menu option *Main Selection*, and the selection window is displayed in Figure 3.5.

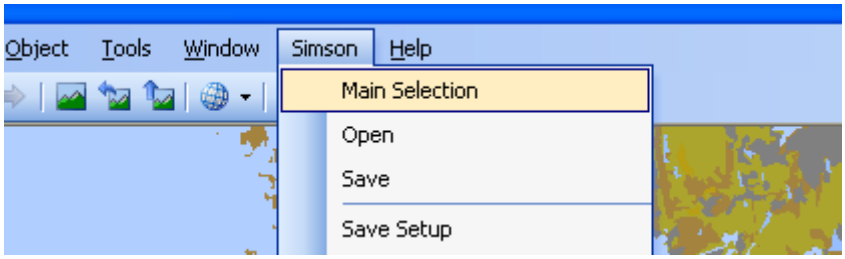


Figure 3.4 Selection of Main Selection

All available exercises are shown on the left side. Expand the tree to view the contents of each exercise.

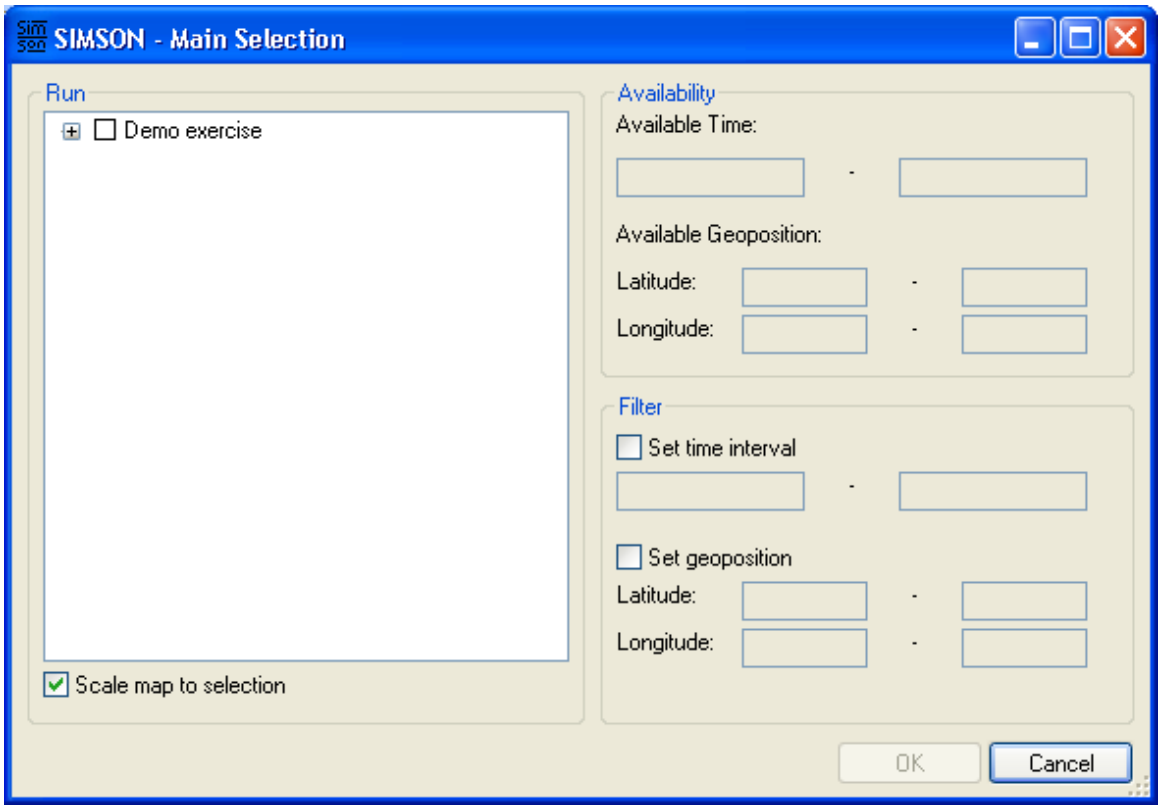


Figure 3.5 Main Selection window

To select one or more exercises, check off the box in front of the exercise.

3.2.1 Filtering data in Main Selection

When one or more exercises are selected, the total time interval from start to stop, and geographical extent in latitude and longitude, are shown in the top right of the window. To decrease the time interval and geographical extent, check off the *Set time interval* and *Set geoposition* boxes. Values can now be edited, see Figure 3.6.

The formats for the values are:

Time: dd.MM.yyyy hh:mm → 28.09.2006 18:55
Latitude and longitude: DegDeg mm:ss → 58 27:40

Click OK when satisfied.

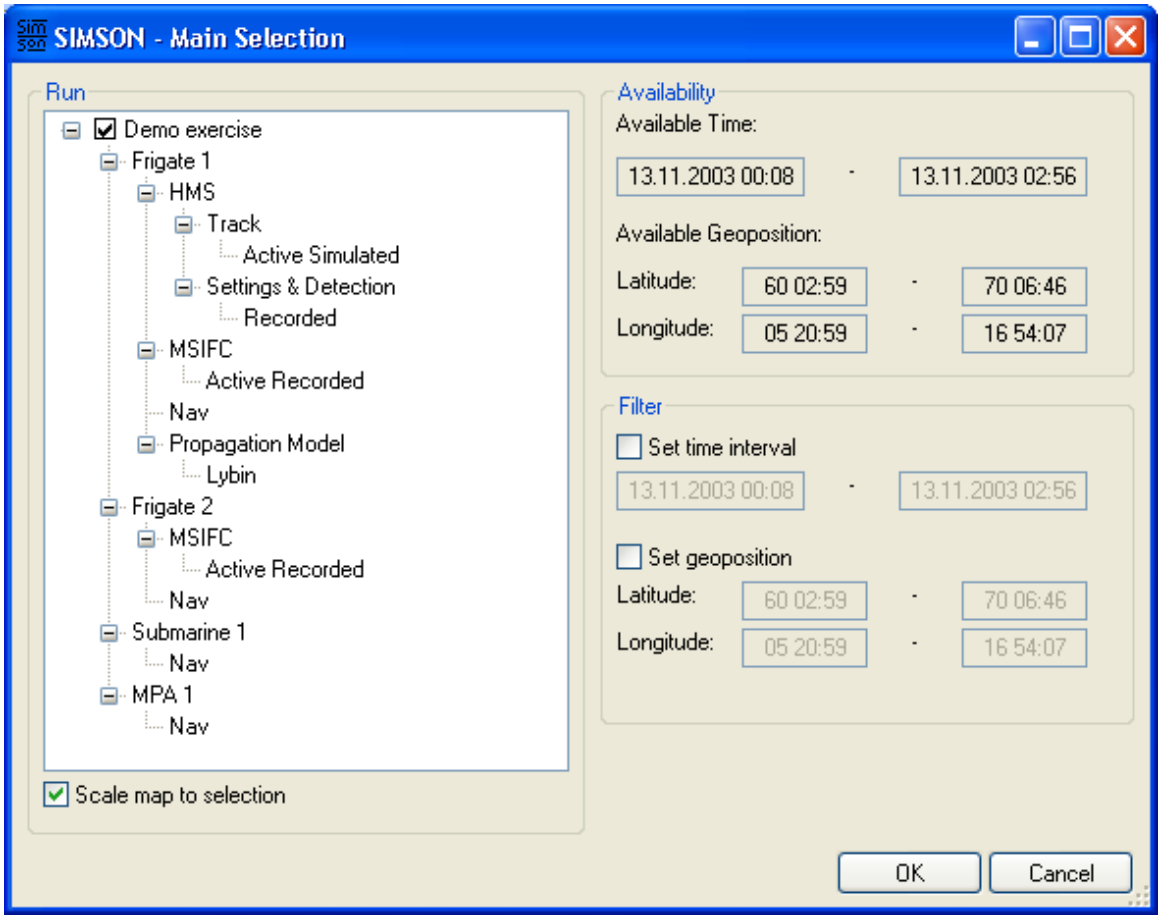


Figure 3.6 One exercise has been selected, and its content has been expanded

3.3 Closing MARIA

To close the application, either click *File* → *Exit*, or the *Close*-button in the top right corner of the application. If changes has been made to the map (zoomed in or map attributes have been changed), a window is displayed asking if changes to the map should be saved.
To save changes, click *yes*. If changes should not be saved, click *no*. Further description of Simson Fennikel saving options, can be found in chapter 13.

Matlab will also automatically be closed when Maria is closed.

4 Relevant Maria functionality

There exists an extensive help function in Maria, but some Maria functionality that is relevant for ASW analysis in Simson Fennikel will be described here. The description in this chapter aims to give a novice Maria user an introduction to essential functionalities.

To access the help function, click *Help* → *Contents*.
For further information about the Maria application, go to [1].

4.1 Relevant Maria menus and toolbars for ASW analysis

The Maria application is a generic tool for a lot of different applications; therefore quite a lot of the functions are not relevant for ASW analysis. We will here give an overview of the most relevant menus and toolbars.

The menu bar in the top of the application window has some options that are especially relevant for Simson Fennikel:

- **Edit**. This menu includes making a copy of map snapshots, see section 4.4.
- **View**. This menu contains available sub windows in Maria. The *Map Editor* window is described in section 4.2, and the *Map Information* window is described in section 4.3. Simson Fennikel specific windows are described in later chapters.
- **Simson**. This menu holds Simson Fennikel specific functionalities which are described in later chapters.

The Maria application holds various toolbars which can be made available by the user. To access the toolbars click *View* → *Toolbars*. An alternative is to right click in the toolbar area on the screen, see Figure 4.1.

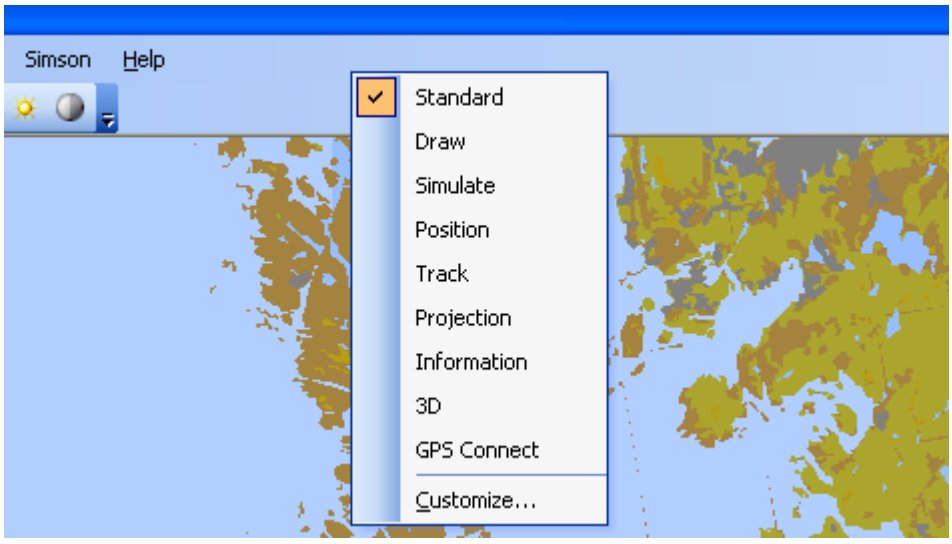


Figure 4.1 Accessing toolbars with a context menu

The following toolbars and toolbar options may be relevant for Simson Fennikel users:

- **Standard**. Contains options for zooming, move around in the map, set scales etc.
  Magnifying glasses
  To zoom in on an area, click the magnifying glass with a "+"-sign, left click and hold. Drag the mouse to make a frame around the area to zoom in on.
  To zoom out of, click the magnifying glass with a "+"-sign.
  Pan map (the "hand" symbol)
  To move to an area outside the visible part of a map, click the "hand" icon, left click and hold. Drag the mouse to the desired direction.
  Arrows
  To return to a previously used scale, use the arrows to move back and forth in history.
  Map grid
  To put on a map grid, e.g. lat/long, click the "globe" icon. Properties for the grid may be set by clicking the arrow next to "globe" symbol.
- **Draw**. Contains options for drawing objects on the map.
  Range ring
  To create a ring around a point in the map, click the range ring icon ("target" sign) and left click on a point. Drag the mouse out to a desired range and left click again to set the range ring.
  Reference point
  To set a reference on point in a map, click the reference point icon ("drawing pin") and left click on a point in the map to set the reference point.
- **Position**. Contains fields showing position coordinates and bearing/distance between points on the map.
  Bearing/distance between points in the map
  To view bearing/distance, click on a point in the map and hold. Drag the mouse to another position and read the bearing and distance in the fifth textbox from the left (if all textboxes in the Position are showed).
- **Information**. This toolbar is linked to the Map information window. Contains options for information on areas, vectors (i.e. contours) and points. See section 4.3 for further information.

Please see Maria's help function for further information.

4.2 Map editor

The *Map editor* in Maria is a powerful tool. Here manipulation of the map to display exactly the desired information is possible.
To access the map editor, click *View* → *Map Editor*.
A new window is then displayed, see Figure 4.2.

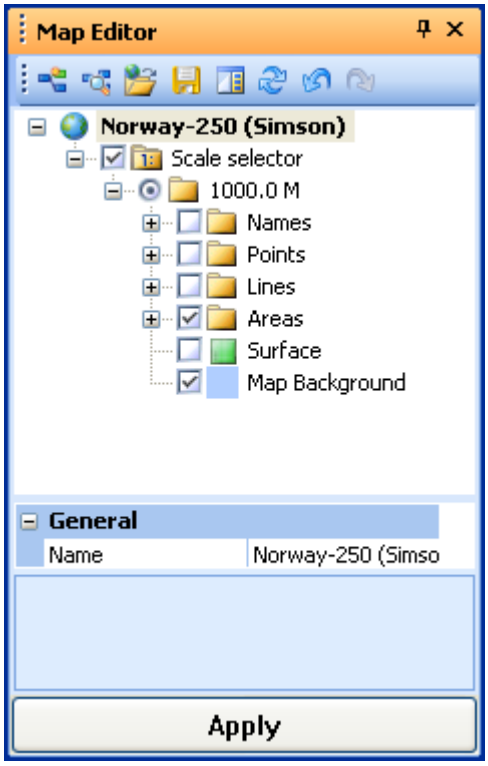


Figure 4.2 The Map Editor in Maria

The window gives the possibility to add or remove map information.
To view the contents of each scale, click the “plus” sign in front of the scale. This will expand the exercise to show its contents. The scale used in the displayed map is marked.
To add or remove information on the various levels, check or uncheck the information types. See the catalogue *Map creator functions* in the help function for a full description.

4.3 Map information

The *Map information* window is heavily linked to the *Information* toolbar. Here information on areas, lines (e.g. contours), map points and elevation data can be displayed. However, the most relevant information for Simson Fennikel users is area and lines information.
To access the map information, click *View* → *Other Windows* → *Map Information*.
A new window is then displayed, see Figure 4.3.

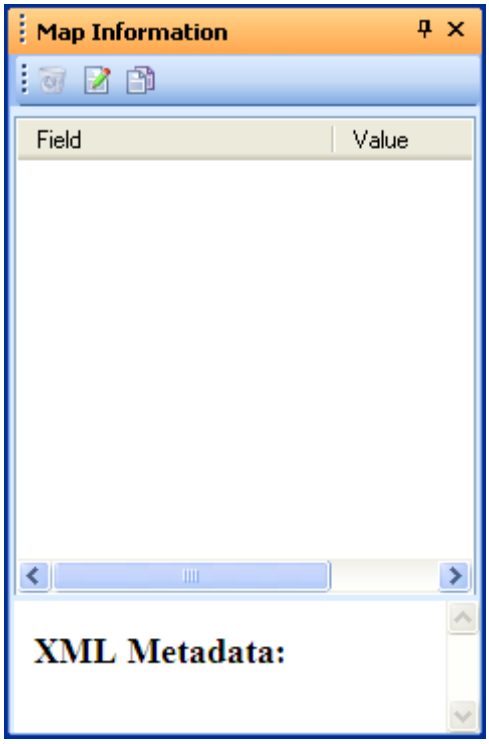


Figure 4.3 The Map information window in Maria

- To view information about an area on the map, click the "area" button to the left on the Information toolbar. Then click on an area on the map and available information on the area will be displayed in the *Map Information* window.
- To view vector information (lines, e.g. contours) on the map, click the "vector" button on the Information toolbar. Then click on a line on the map and available information on the line will be displayed in the *Map Information* window.

To remove information from the information window, click the "tray" icon in the top left corner of the Map Information window.
For more information about the *Map Information* window, see the catalogue *Map creator functions* → *Map Information* → *Information about vector map themes* in the help function.

4.4 Snapshots

There are various possibilities in Maria to copy graphics from the geotactical display (Figure 4.4):

- To copy objects drawn on the map, click the object and then *Edit* → *Copy*
- To take snapshot (copy) of a map without displayed exercise data, click *Edit* → *Snapshot* → *Map Only*.
- To take snapshot (copy) of a map with displayed exercise data, click *Edit* → *Snapshot* → *Map and Data*.

Click *Edit* → *Paste* to insert the copied graphics in another editor or document.

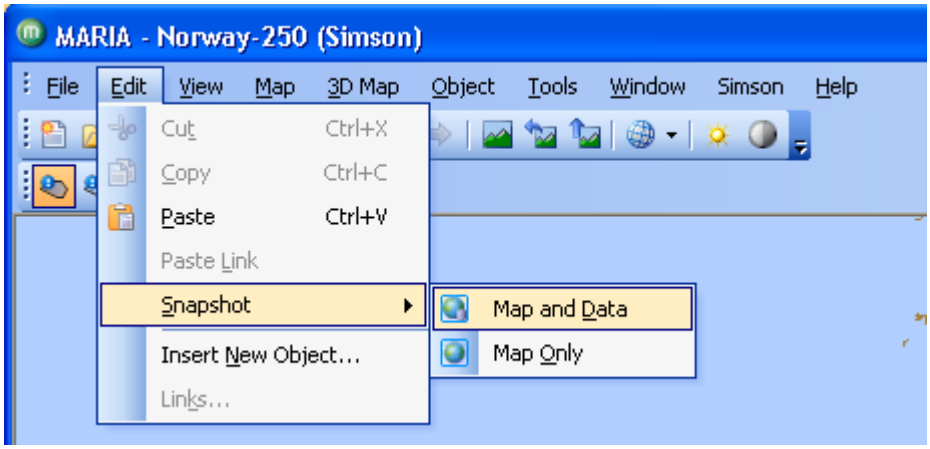


Figure 4.4 The Edit function in Maria

5 Performing ASW analysis using Simson Fennikel

Simson Fennikel is an analysis-software for the ASW capabilities of the “Fridtjof Nansen” class frigates. This chapter describes the process of selecting recorded data, and then how to display on the map in Maria for analysis.

The functionalities described in this chapter are found in the *ASW* window and the *Dynamic* window.

5.1 Starting the analysis

In section 3.2, the selection of an exercise was described. Assuming this step completed, one or more exercises are selected for analysis. Figure 5.1 gives an overview of the analysis process. We have entered the second process in the diagram.

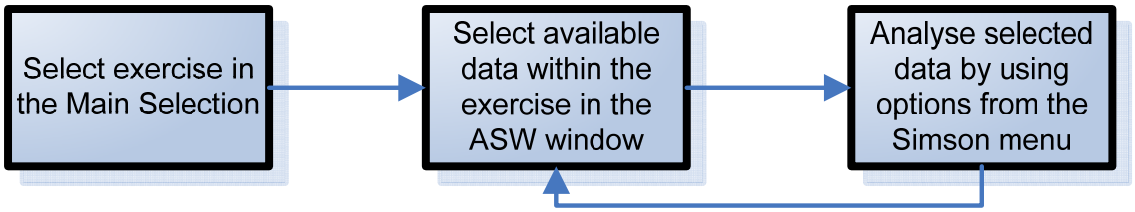


Figure 5.1 Overview of the process for analyzing data in Simson Fennikel

After having selected one exercise, in this case **Demo Exercise**, the Maria window may appear like Figure 5.2. The different tabs in the *ASW* window are populated with various types of data from the exercise.

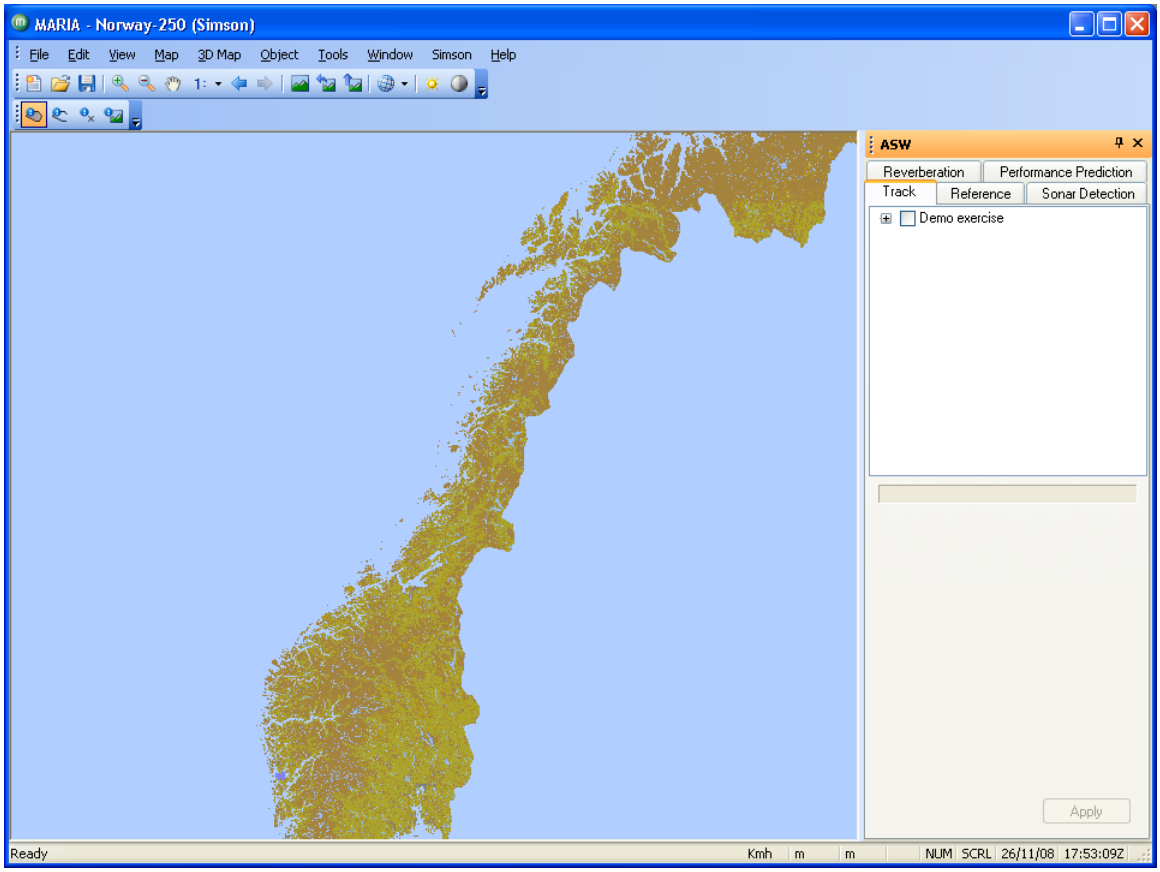


Figure 5.2 The SIMSON Fennikel application after one exercise has been selected

Optionally, select *Simson* → *Properties* to change the start- and/or stop time. These properties determine the time span of the data to be displayed.

A properties window will be displayed, and the global time span values for the data can be edited. Figure 5.3 shows the window for the global properties. Section 12 describes setting Global Properties.

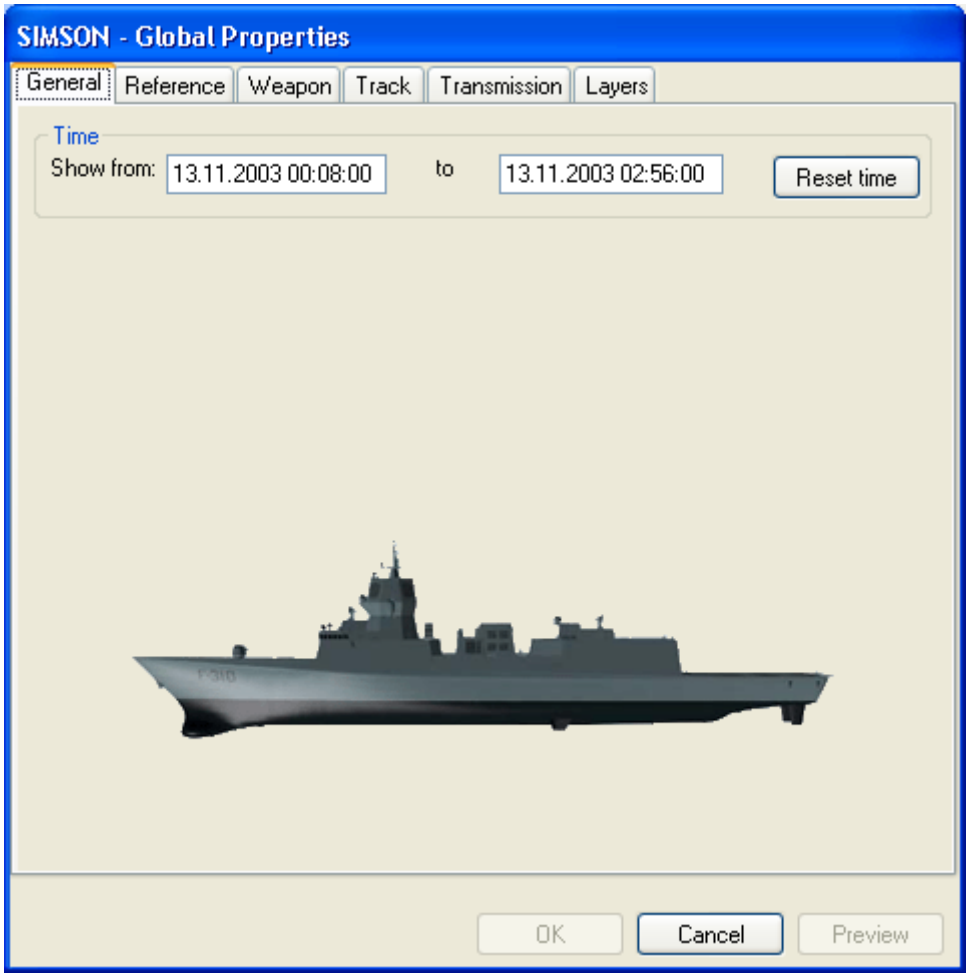


Figure 5.3 Global general properties

5.2 Displaying navigation reference data

Reference data is recorded navigation trajectories from different platforms. The data are imported into the Simson database with the software Simson Fennikel Collector [5].

5.2.1 Reference tab in the *ASW* window

To view platform trajectories, select the tab named *Reference* in the *ASW* window.
If multiple trajectory recordings exist, all are listed under the platform.
One trajectory for each platform is by default selected.

In the filter section of the *Reference* tab, data can be filtered on time. To filter on time, check the box next to *Time span* and edit the *Min* and *Max* values. The effect of editing the time span is the same as described in section 3.2.1.

Click the *Apply* button to view the selected platforms. The result, shown in Figure 5.4, is zoomed in by using the zoom button in Maria. See section 4.1 for a description of the toolbar in Maria. The selected platforms are also listed in the Track Table, described in chapter 8.

To transfer the start and stop time of the platform's trajectory to the time filter section, right-click on a platform trajectory in the *Reference* tab and select *Set Time Span As Filter*.

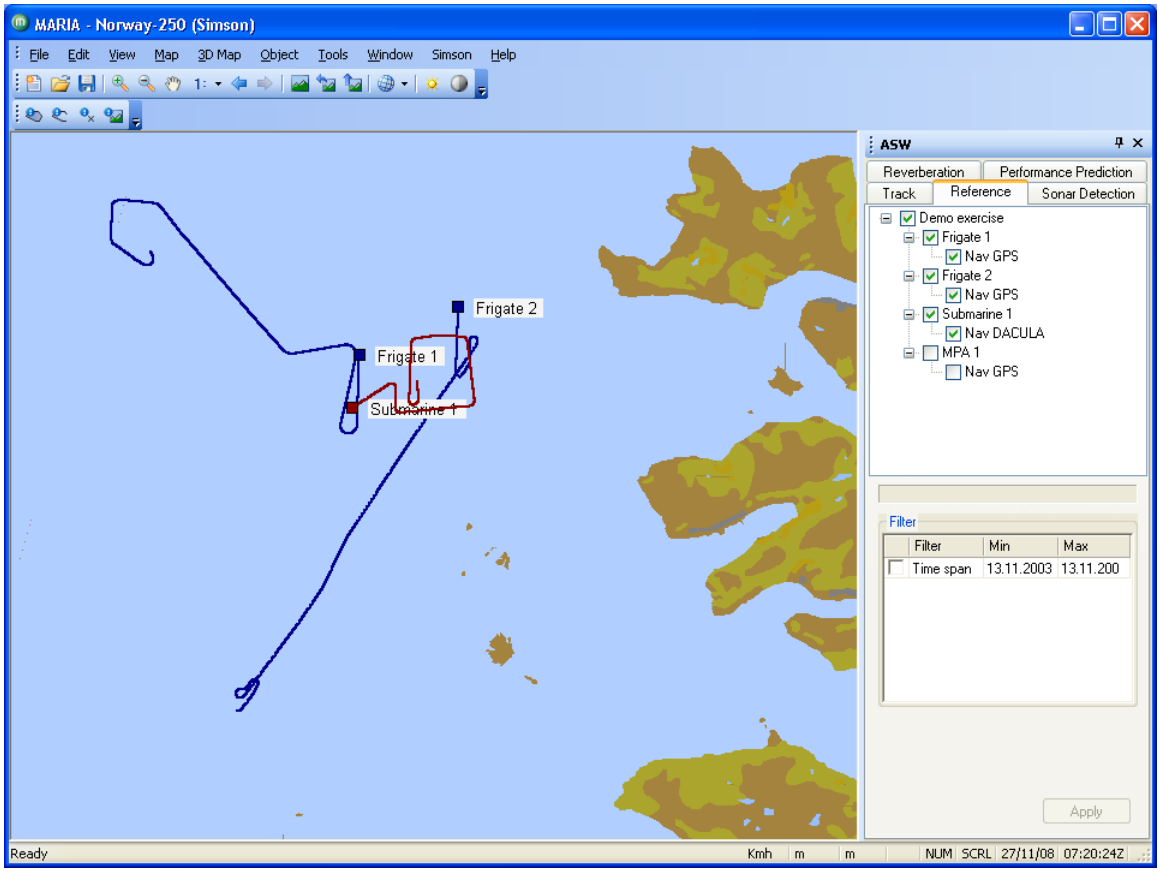


Figure 5.4 Reference trajectories in Maria

Data selected in the *Reference* tab will automatically be displayed during the *Dynamic playback* functionality, described in chapter 6.

5.2.2 Filtering reference data

Platform trajectories can be filtered on:

- Time span: The entire trajectory is included if it exists at some point during this time span.

5.3 Displaying sensor track data

Tracks are recorded tracks from the system on board the frigate. Sources of data may be MSIFC, HMS or ATAS. The data is imported into the Simson database with the software Simson Fennikel Collector[5].

5.3.1 Track tab in the *ASW* window

To view tracks, click the *Track* tab in the *ASW* window. Expand the nodes and check the boxes in front of the data to be displayed, see Figure 5.5.

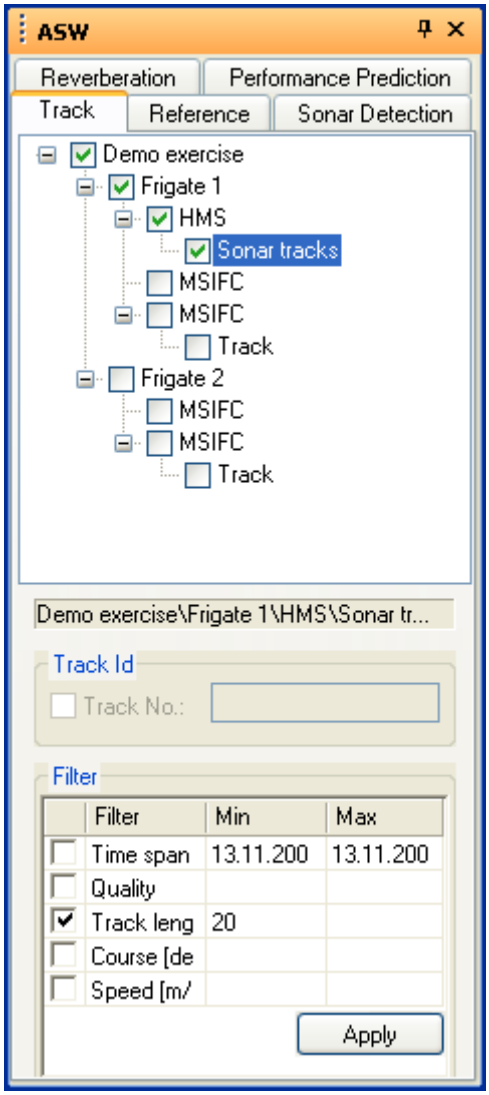


Figure 5.5 The Track tab with expanded nodes

There are two more sections beneath the tree view in the track tab:

- The track id section which is not yet implemented
- In the filter section, track data can be filtered on different parameters. See section 5.3.2 for description of the filter parameters.

Click the *Apply* button to view the tracks in Maria. As with reference trajectories, multiple sets of data can be selected at the same time.
Figure 5.6 display the presentation of track data in Maria.

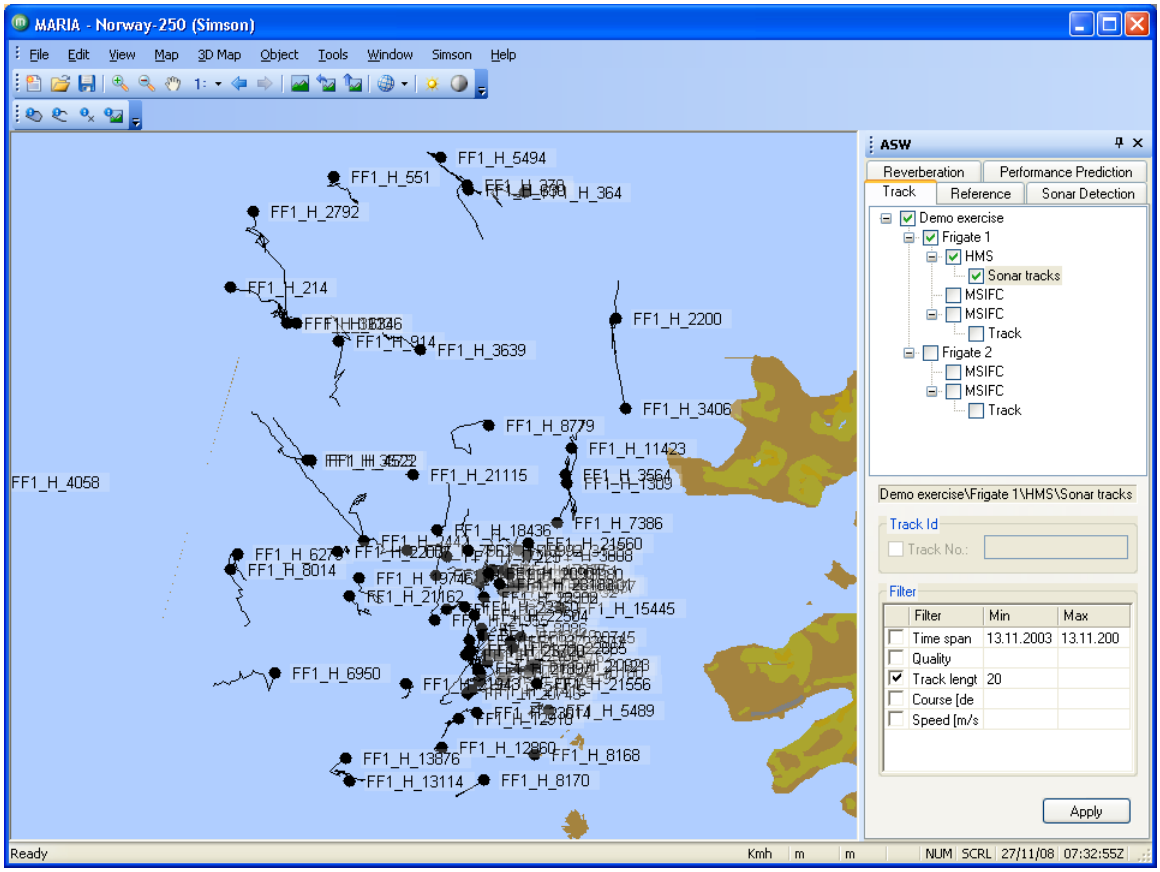


Figure 5.6 Tracks in Maria

To remove tracks, uncheck previously checked data in the *Track* tab and click the *Apply* button. Filtering of tracks belonging to different platforms or sensors must be performed for each platform or sensor.

Data selected in the *Track* tab will automatically be displayed during the *Dynamic playback* functionality, described in chapter 6.

5.3.2 Filtering active track data

MSIFC tracks can be filtered on:

- *Time span*: The entire track is included if it exists at some point during the time span.
- *Track length*: The entire track is included if it has a length between min and max.
- *Course*: The entire track is included if it has a course value between min and max.
- *Speed*: The entire track is included if it has a speed value between min and max.

Sonar tracks (ATAS or HMS) can be filtered on:

- *Time span*: The entire track is included if it exists at some point during the time span.
- *WOE* (weight of evidence): The entire track is included if it has a WOE value between min and max.
- *Track length*: The entire track is included if it has a length between min and max.
- *Course*: The entire track is included if it has a course value between min and max.
- *Speed*: The entire track is included if it has a speed value between min and max.

5.3.3 The track label

Tracks displayed in Maria have track labels attached to them.

The system distinguishes between to types of track when a track label is created:

- System tracks from MSIFC.
  Format: <platform short name>_<MSIFC track number>
  Example: FNAN_110025
- Sonar tracks from the sonars.
  Format: <platform short name>_<sonar>_<sensor track number>
  Examples: FNAN_H_7396, FNAN_A_7396

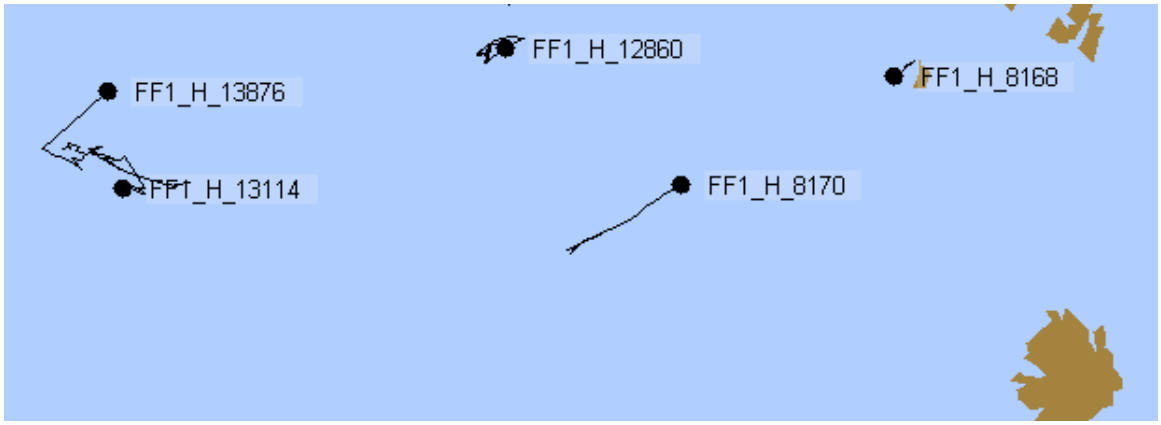


Figure 5.7 Tracks with track labels (sonar tracks)

Format description:
<platform short name>: This is an abbreviated version of the platform name, e.g. 'FNAN'.
<sonar>: We distinguish between:

- HMS-tracks indicated with an 'H'.
- ATAS-tracks indicated with an 'A'.

<MSIFC track number>: The track number displayed on the supervisor console
<sensor track number>: The local track number of the current sensors tracking algorithm

The labels for HMS-tracks are displayed in Figure 5.7 .

5.3.4 Passive tracks

Passive tracks can be selected in the same way as active tracks and they can be filtered on:

- *Time span*: The entire track is included if it exists at some point during the time span.
- *Track length*: The entire track is included if it has a length between min and max.
- *Bearing*: The entire track is included if it has a bearing value between min and max.

Passive tracks have the same label format as active tracks.

5.4 Displaying transmission related data

In Simson Fennikel, the word “Transmission” is used as a collective term for transmission related data, as echoes and sonar properties. Obviously only the active detections, called echoes, are displayed on the map. Other transmission related data are found in a transmission table, described in section 9.

Sources of data may be HMS or ATAS. The data is imported into the Simson database with the software Simson Fennikel Collector [5].

5.4.1 Sonar detection tab in the *ASW* window

To display echoes in Maria, click the Sonar Detection tab in the *ASW* window. Expand the nodes and check the boxes in front of the data to be displayed, see Figure 5.8.

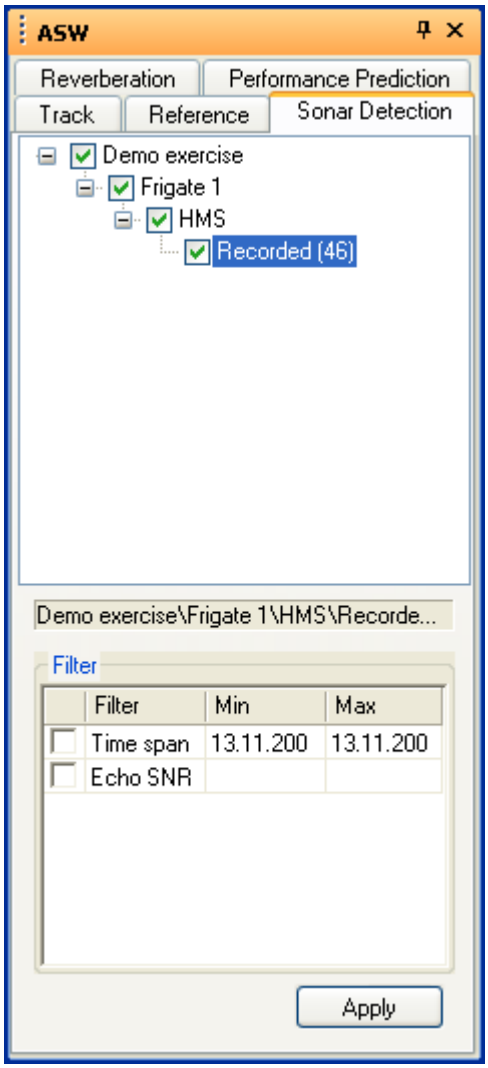


Figure 5.8 The Sonar detection tab with expanded nodes

There is one more section beneath the tree view in the *Sonar detection* tab:

- In the filter section, track data can be filtered on different parameters. See section 5.4.2 for description of the filter parameters.

Click Apply to display the echoes on the map in Maria. As with tracks and platform trajectories, transmissions from multiple platforms or sensors can be selected at the same time. Figure 5.9 shows transmissions displayed on the map in Maria.

The values used to colour-code echoes are according to the signal to noise ratio (SNR) properties. The colour code can be set in Global Properties for all data displayed, see section 12.4, or it can be set for a specified recording, or even one specific transmission, see section 9.2.

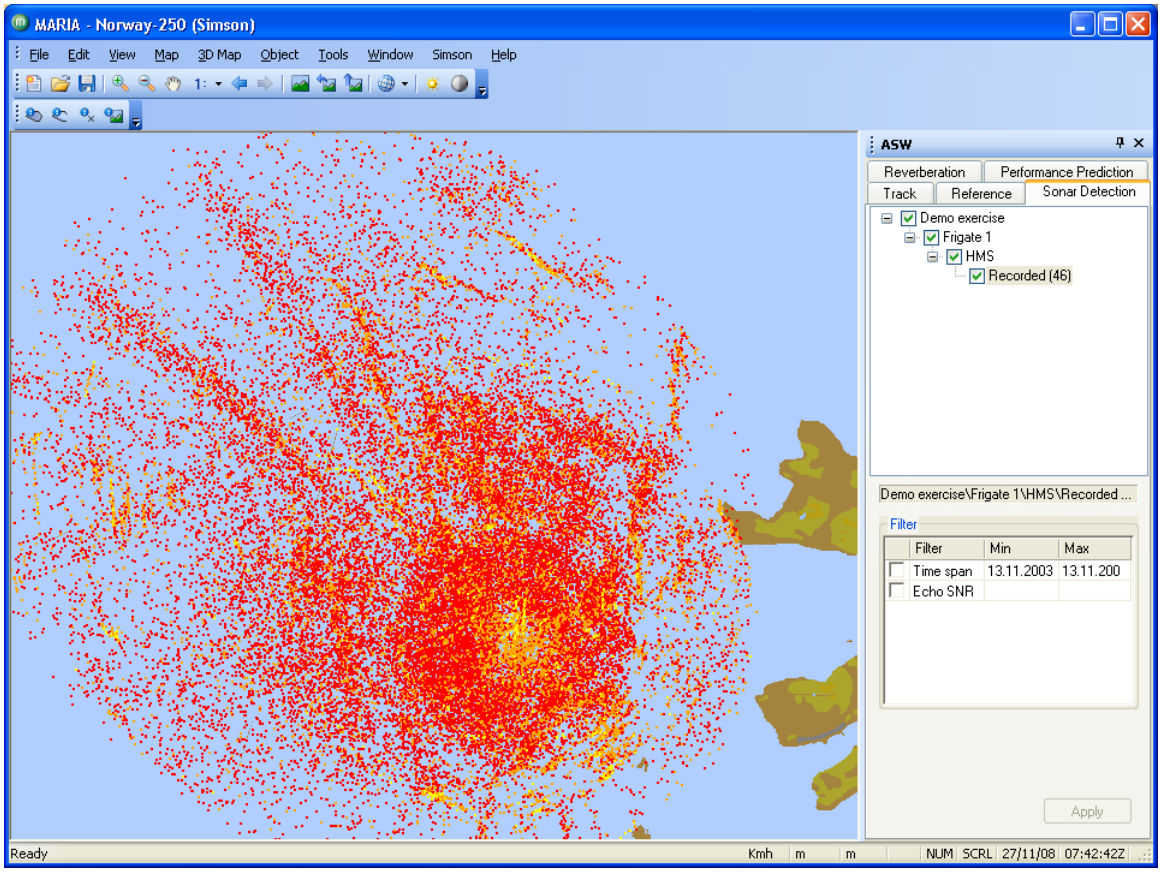


Figure 5.9 Transmissions in Maria

For more information on how to use the transmission data further in the analysis, see description of the transmission table in chapter 9.

Data selected in the *Sonar detection* tab will automatically be displayed during the *Dynamic playback* functionality, described in chapter 6.

5.4.2 Filtering transmission data

Transmissions can be filtered on:

- *Time span*: Echoes from transmissions within the time span will be loaded.
- *Echo SNR in Tx*: The entire transmission (all echoes) is included if it has an echo with SNR value (dB) between min and max.

5.5 Displaying reverberation data

Reverberation data are the recorded reverberations from the system on board the frigate. Sources of data may be HMS or ATAS. The data are imported into the Simson database with the software Simson Fennikel Collector [5].

5.5.1 Reverberation tab in the *ASW* window

To view reverberation data on a map, select the *Reverberation* tab in the *ASW* window. Expand the nodes and check the boxes in front of the data to be displayed, see Figure 5.10.

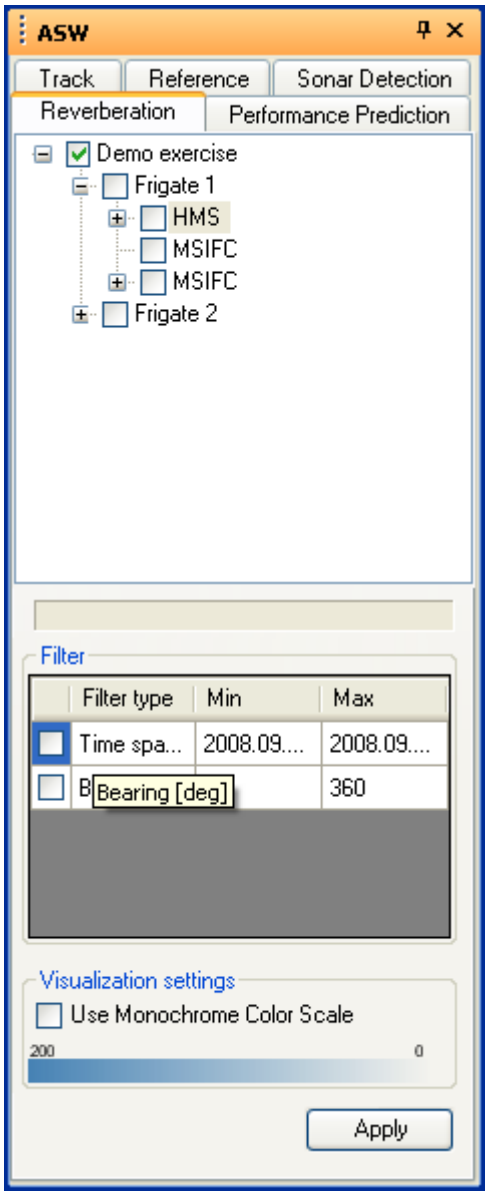


Figure 5.10 The Reverberation tab with expanded nodes

There are two more sections beneath the tree view in *Reverberation* tab:

- In the filter section, reverberation data can be filtered on different parameters. See section 5.5.2 for description of the filter parameters.

- In the visualization settings section, settings for how to present the reverberation data can be altered. See section 5.5.3 for a description of the parameters.

Click the *Apply* button to view the reverberation data. Figure 5.11 shows reverberation displayed in Maria.

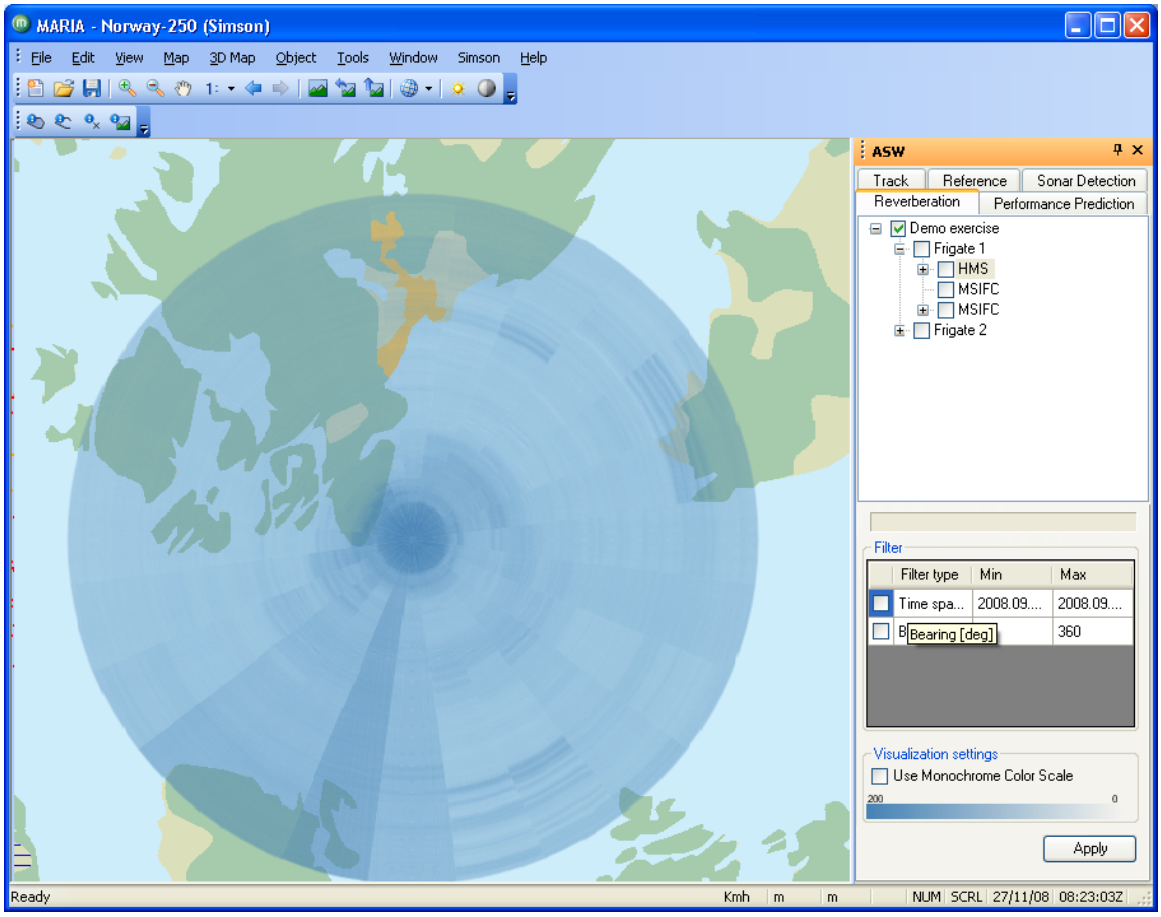


Figure 5.11 Reverberation data in Maria

Data selected in the *Reverberation* tab will automatically be displayed during the *Dynamic playback* functionality, described in chapter 6.

5.5.2 Filtering reverberation data

Reverberation data can be filtered on:

- Time span: Reverberation data within the time span are displayed.
- Bearing: Only reverberation data between min and max are displayed.

5.5.3 Visualization settings

The following settings can be set:

- Min/Max Scale Value: The min and max values represent the dynamic range of the colour grading. By narrowing the range, more detail could be achieved.

- Plot Color: The colour to be used for the reverberation data rose.
- Transparency: Weight of transparency for the reverberation data rose;
    - Value 0 is no transparency; the map beneath the reverberation rose is not visible in the areas with high values.
    - Value 100 is fully transparent; the reverberation rose is not visible.

5.6 Displaying predicted sonar performance

Performance Prediction data are data calculated by the FFI software *Sonar Performance Prediction Service*, SPPS. This application uses the ray trace model LYBIN [3] to calculate probability of detection, signal excess, total reverberation and transmission loss around a reference point. This results in performance prediction beams around a reference point up to a defined range, on a defined depth and with a defined resolution. The data is then loaded into the database and ready to be visualized by Simson Fennikel.

5.6.1 Performance Prediction tab in the *ASW* window

To view performance prediction data, click the Performance Prediction tab in the analysis window. Expand the nodes and check the boxes in front of data in the categories *PoD* (probability of detection), *SignalExcess*, *TotalReverberation* or *TransmissionLoss*, see Figure 5.12.

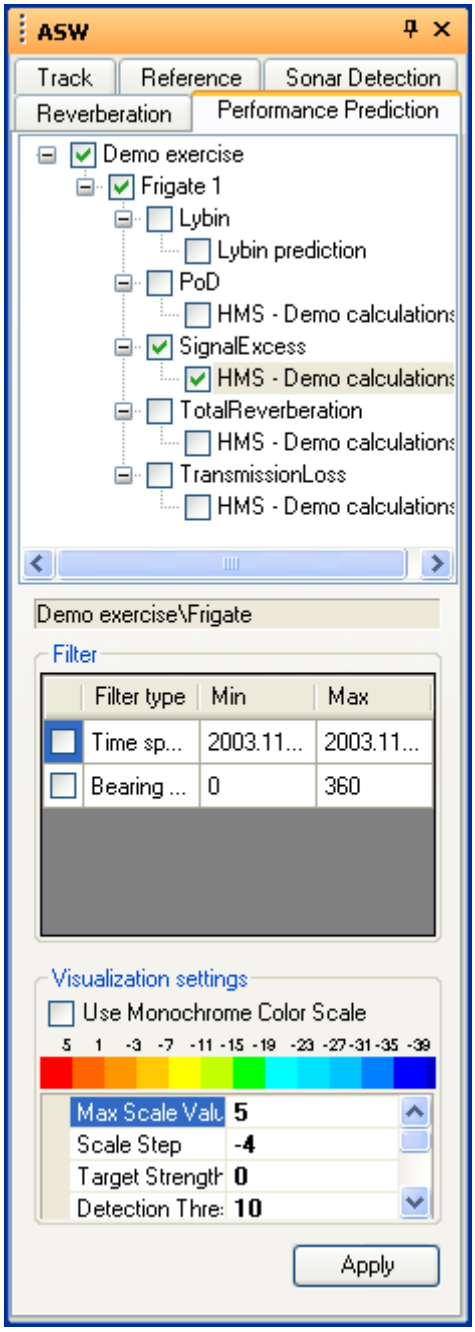


Figure 5.12 Performance Prediction tab with expanded nodes

There are two more sections beneath the tree view in the *Performance prediction* tab.

- In the filter section, performance prediction data can be filtered on different parameters. See section 5.6.2 for description of the filter parameters.
- In the visualization settings section, settings for how to present the performance prediction data can be altered. Maximizing the application window to find the visualization settings may be necessary. See section 5.6.3 for a description of the parameters.

Click Apply to view the performance prediction data. Figure 5.13 shows a performance prediction view in Maria.

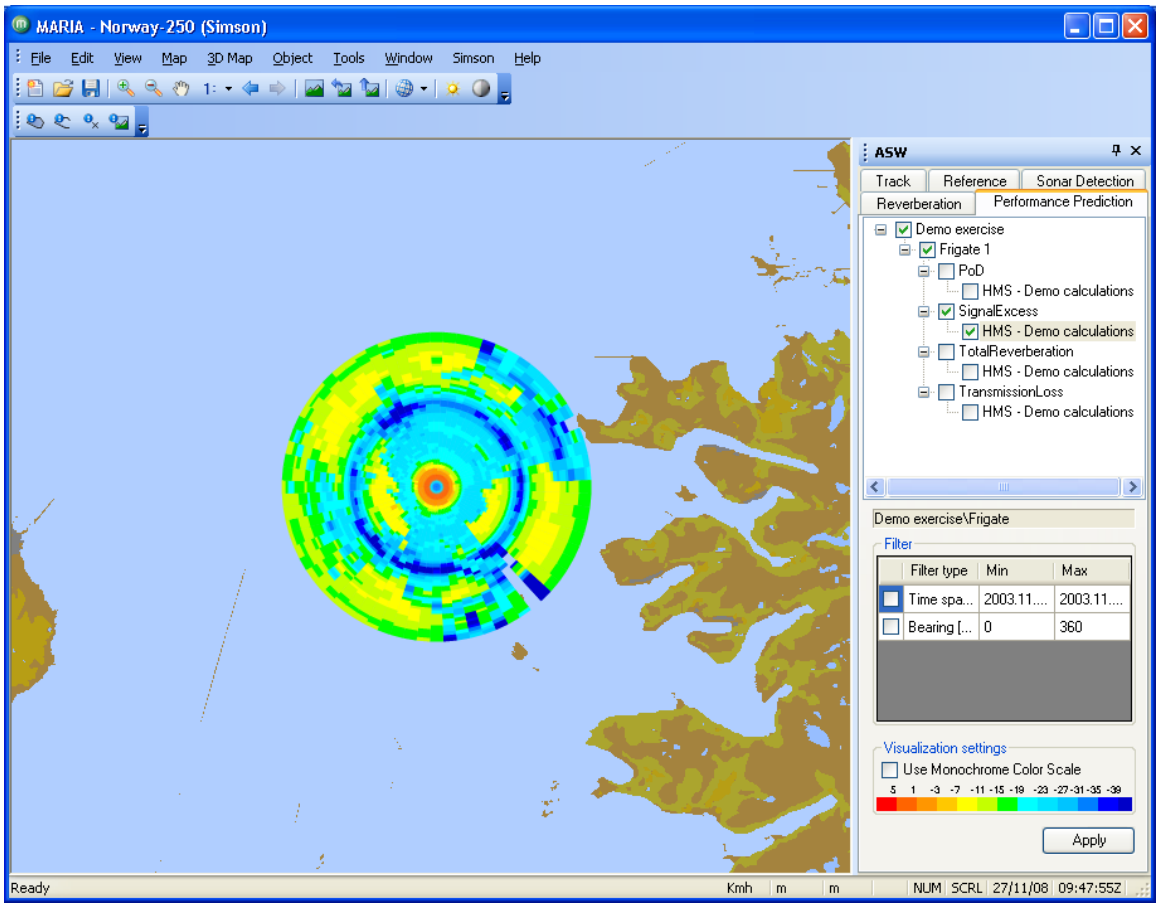


Figure 5.13 Performance Prediction data in Maria

During Dynamic playback, described in chapter 6, the performance prediction data will be stepped through on the map.

5.6.2 Filtering performance prediction data

Performance Prediction data can be filtered on:

- *Time span*: The performance prediction data is included if the corresponding transmission is within the time span.
- *Bearing*: The performance prediction data that is between min and max is included.

5.6.3 Visualization settings

The visualization settings can be used in two modes;

- Intervals in the value domain are set with fixed colours. We call this mode “Fixed”.
- Monochrome colours scale. One colour is used for the value domain, but tones indicate the different value intervals. We call this mode “Monochrome” and this mode is entered by clicking the checkbox in front of *Use Monochrome Color Scale*.

A general rule is that the settings become visible when the data is drilled down to the innermost level. Only one data type can be visualized at any time.

Visualization settings available are dependent on what data category we look at. Table 5.1, Table 5.2, Table 5.3 and Table 5.4 describes the settings. The column *Mode specific* describes whether the setting is applicable for mode *Fixed*, *Monochrome* or for both (blank).

Data Category PoD (Probability of detection)		
Mode specific	Setting	Description
Fixed	Transparent Min (True/False)	If set to *True*, the colour for the minimum value is completely transparent. This means the map beneath the performance rose is replacing this colour.
Monochrome	Max Scale Value	The maximum value in the value domain over which the colour gradate (dB)
Monochrome	Min Scale Value	The minimum value in the value domain over which the colour gradate (dB).
Monochrome	Plot Colour	The base colour which the monochrome colour scale use.
	Transparency	Weight of transparency for the PoD data rose; • Value 0 is no transparency; the map beneath the reverberation rose is not visible in the areas with high values. • Value 100 is fully transparent; the reverberation rose is not visible.
	Tx. No.	The transmission number within the loaded dataset.

Table 5.1 Settings for Data category Probability of detection

Signal Excess		
Mode specific	Setting	Description
Fixed	Max Scale Value	The maximum scale value (dB).
Fixed	Scale Step	The magnitude of the value intervals within the scale (dB).
Fixed	Target Strength	Possible to manipulate target strength (dB).
Fixed	Detection Threshold	Possible to manipulate detection threshold (dB).
Fixed	Transparent Min (True/False)	If set to *True*, the colour for the minimum value is completely transparent. This means the map beneath the performance rose is replacing this colour.
Monochrome	Max Scale Value	The maximum value in the value domain over which the colour gradate.
Monochrome	Min Scale Value	The minimum value in the value domain over which the colour gradate.
Monochrome	Plot Colour	The base colour which the monochrome colour scale

		use.
	Transparency	Weight of transparency for the signal excess data rose; • Value 0 is no transparency; the map beneath the reverberation rose is not visible in the areas with high values. • Value 100 is fully transparent; the reverberation rose is not visible.
	Tx. No.	The transmission number within the loaded dataset.

Table 5.2 Settings for Data Category Signal Excess

TotalReverberation		
Mode specific	Setting	Description
Fixed	Max Scale Value	The maximum scale value (dB).
Fixed	Scale Step	The magnitude of the value intervals within the scale (dB).
Fixed	Transparent Min (True/False)	If set to *True*, the colour for the minimum value is completely transparent. This means the map beneath the performance rose is replacing this colour.
Monochrome	Max Scale Value	The maximum value in the value domain over which the colour gradate.
Monochrome	Min Scale Value	The minimum value in the value domain over which the colour gradate.
Monochrome	Plot Colour	The base colour which the monochrome colour scale use.
	Transparency	Weight of transparency for the reverberation data rose; • Value 0 is no transparency; the map beneath the reverberation rose is not visible in the areas with high values. • Value 100 is fully transparent; the reverberation rose is not visible.
	Tx. No.	The transmission number within the loaded dataset.

Table 5.3 Settings for Data Category TotalReverberation

TransmissionLoss		
Mode specific	Setting	Description
Fixed	Max Scale Value	The maximum scale value (dB).
Fixed	Scale Step	The magnitude of the value intervals within the scale (dB).
Fixed	Transparent Min (True/False)	If set to *True*, the colour for the minimum value is completely transparent. This means the map beneath the performance rose is replacing this colour.

Monochrome	Max Scale Value	The maximum value in the value domain over which the colour gradate.
Monochrome	Min Scale Value	The minimum value in the value domain over which the colour gradate.
Monochrome	Plot Colour	The base colour which the monochrome colour scale use.
	Transparency	Weight of transparency for the transmission loss data rose; • Value 0 is no transparency; the map beneath the reverberation rose is not visible in the areas with high values. • Value 100 is fully transparent; the reverberation rose is not visible.
	Tx. No.	The transmission number within the loaded dataset.

Table 5.4 Settings for Data Category TransmissionLoss

6 Dynamic playback of displayed data

Dynamic playback is a key concept in Simson Fennikel. Therefore we present it quite early and refer to it in later sections where we describe the Simson menu.

In Simson Fennikel we have the possibility to present the data in dynamic mode. The dynamic mode presents data as an animation, and thus gives an opportunity to study time correlated events.

There are multiple parts of the analysis functionality in Simson Fennikel that are being updated during the dynamic playback.

- The map will be populated over time with data selected from the ASW window.
- Technical plots may optionally be updated with the current playback time. Technical plots are described in chapter 11 and the dynamic plot mode in section 11.7.
- Tables listing various data will have highlighted row, correlating with the current playback time. These tables are listed in section 6.3 and described further in a chapter later in the document.

To start dynamic playback, open a new window placed in the View menu on the top of the screen:

View → *Dynamic*

Please note that dynamic playback will be performed on the data selected in the ASW window.

If there are minimum two platforms in the selected exercise, it is possible to stop the dynamic playback and run LYBIN calculations between two platforms. This is performed within the *Lybin Presettings.* This functionality is further described in chapter 14.

6.1 The window for dynamic playback

The *Dynamic* window contains a tree view showing all data selected from the *ASW* window, see Figure 6.1. To remove data from dynamic playback, simply uncheck the platform or data type. Remember to stop dynamic playback if data are to be added/removed in the *ASW* window.

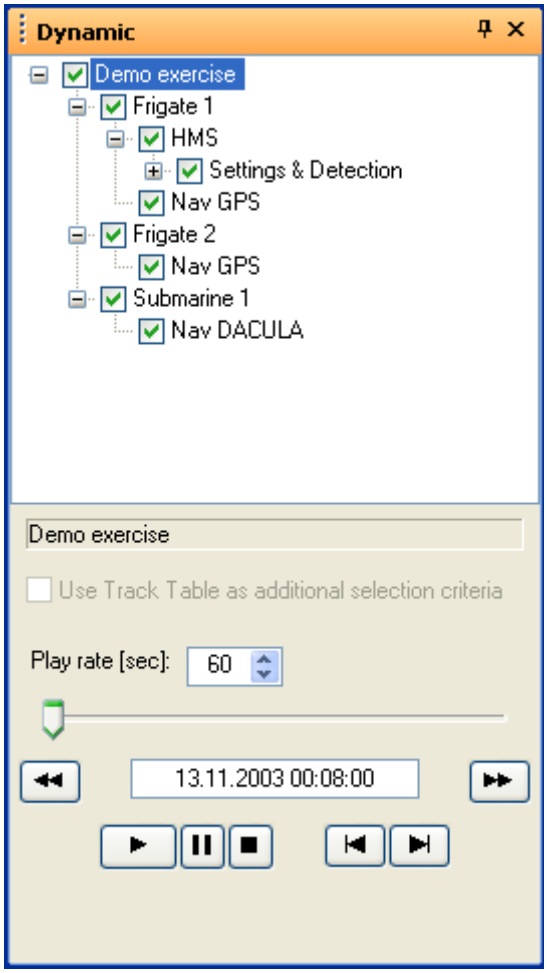


Figure 6.1 The Dynamic Playback window in Simson Fennikel

To start the playback, click the *Play* button.
To increase the playback rate, click the up-arrow button on the play rate value, or type a new value between 1 and 200 seconds.

It is possible to set the current playback time from the *Event Viewer* in Simson Fennikel. Select an item in the event list in the *Event Viewer,* and press the second button on the toolbar to use the time of the event as current time. The event viewer and the link to dynamic playback are further described in chapter 10.

6.2 Properties used in dynamic playback

Some specific properties can be set to control how the different data are displayed in dynamic playback. These properties may be set in general in *Global Properties,* accessed from the *Simson* menu, or set in the properties for the specific data set.

The following dynamic-specific properties can be set for *Reference data*, *Tracks* and *Sonar detection*:

- DynamicDisplayStyle – This property describes how the data is displayed in Maria and have the following values:
    - History – the data type's entire history is displayed.
    - LimitedHistory – a portion of the history is displayed.
    - All – shows the entire trajectory and moves a symbol over it. Not applicable for transmissions
- HistoryLength – if the DynamicDisplayStyle property is LimitedHistory, this property sets the number of seconds of history the data is displayed behind the current point in time.

6.3 Highlighted rows in tables during dynamic playback

As mentioned earlier, tables containing various data are stepped through during dynamic playback. These tables are described in detail later in the document, but listed here for the user's convenience.

- The target table, described in section 8.5.
- The observation browser for reference trajectories, described in section 8.4.
- The transmission table, described in chapter 9.
- The event list in the event viewer, described in chapter 10.

A snapshot of the tables during dynamic playback is displayed in Figure 6.2.

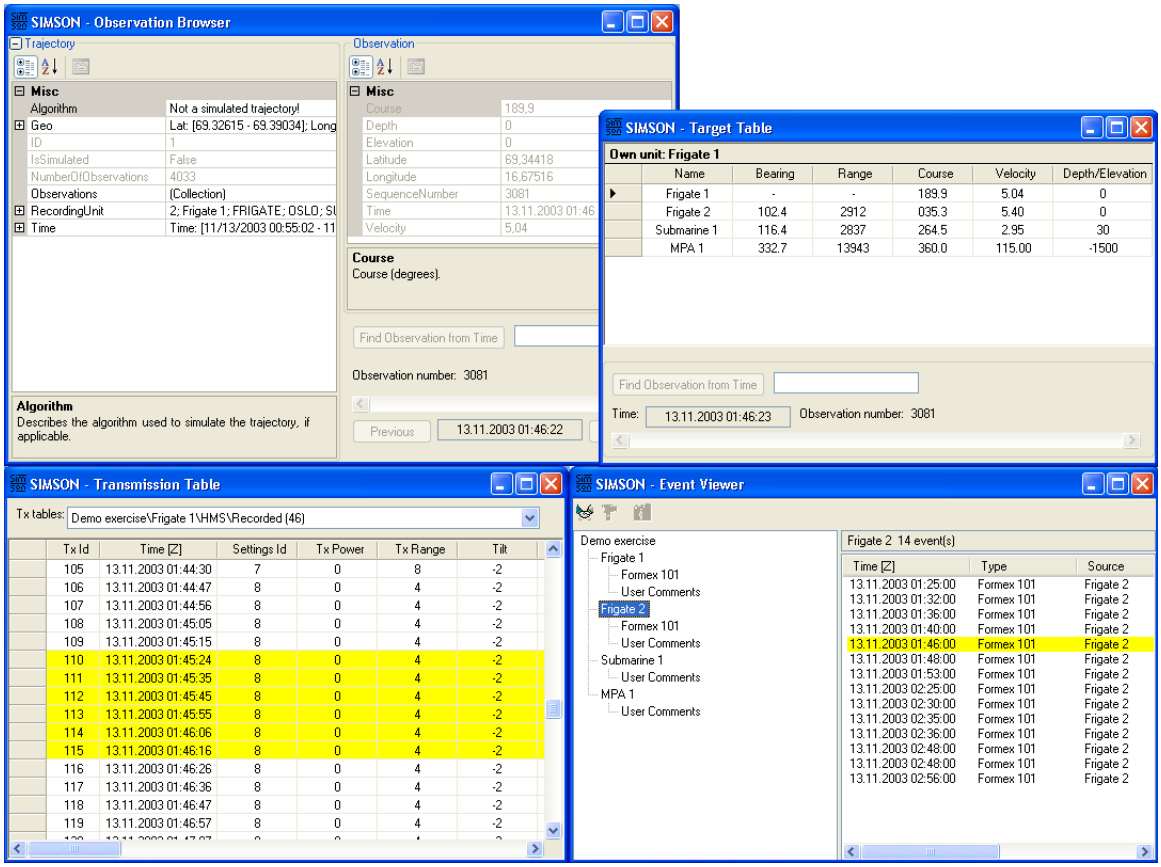


Figure 6.2 A snapshot of the tables that are stepped through during dynamic playback

7 Time calculator

It may be handy to calculate the seconds between two timestamps, e.g. when technical plots (chapter 11) are analyzed where the time-dependent plots are displayed with second on the x-axis.

To access the time calculator, click *View* → *Time Calculator*. This will open the Time calculator in a new window.

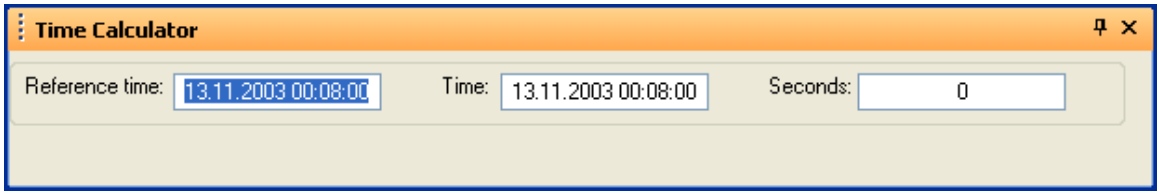


Figure 7.1 The Time Calculator in Simson Fennikel

To find the number of seconds between a reference time and another time value, type a reference time and a time value. Press enter.
→ The textbox *Seconds* will then display the number of seconds.

To find the time value found when adding a number of seconds to the reference time, type a reference time and the number of seconds to add in the textbox Seconds. Press enter.
→ The textbox *Time* will then show the new time value.

The Time Calculator window is resized in the same way as other windows. Please see the description in section 3.1 for more details on how to resize and dock windows.

Please note that if an exercise is selected before the Time Calculator window is opened, the Time Calculator's reference will be the exercise's start time.

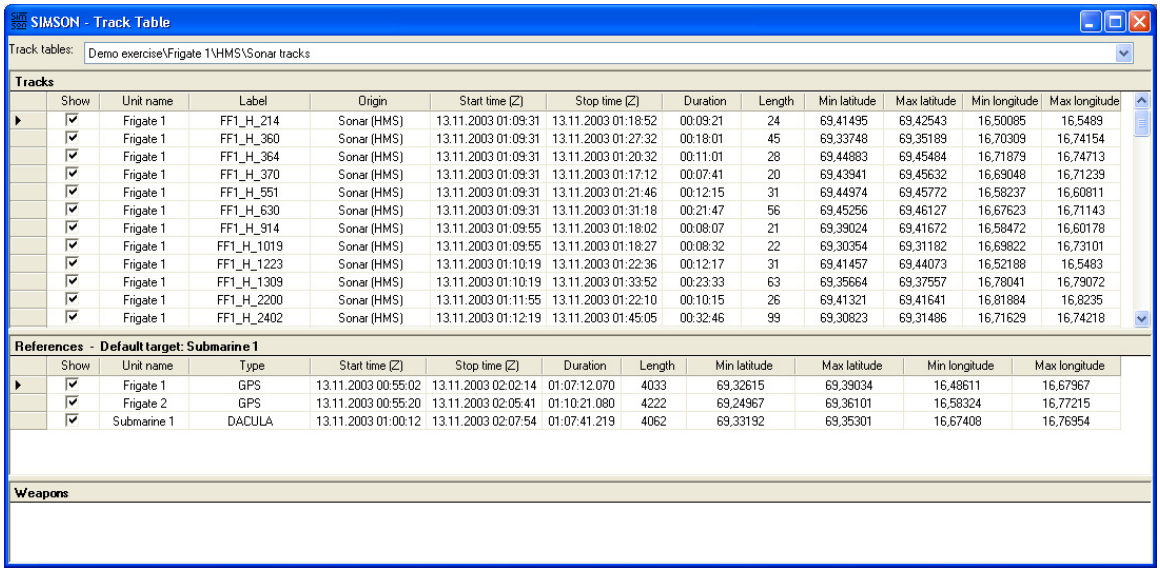
8 Simson menu: The track table

The *Track table* window includes a table representation of the track and navigation reference data sets selected. The tables contain overall information about single trajectories, either sensor track or navigation reference.

The *Track table* is placed in the *Simson* menu on the top of the screen:

Simson → *Track table*

Please note that the tracks to be viewed in the track table must be checked in the ASW analysis window. Figure 8.1 shows the track table for tracks from our exercise.



Show	Unit name	Label	Origin	Start time (Z)	Stop time (Z)	Duration	Length	Min latitude	Max latitude	Min longitude	Max longitude
☑	Frigate 1	FF1_H_214	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:18:52	00:09:21	24	69,41495	69,42543	16,50085	16,5489
☑	Frigate 1	FF1_H_360	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:27:32	00:18:01	45	69,33748	69,35189	16,70309	16,74154
☑	Frigate 1	FF1_H_364	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:20:32	00:11:01	28	69,44883	69,45484	16,71879	16,74713
☑	Frigate 1	FF1_H_370	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:17:12	00:07:41	20	69,43941	69,45632	16,69048	16,71239
☑	Frigate 1	FF1_H_551	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:21:46	00:12:15	31	69,44974	69,45772	16,58237	16,60811
☑	Frigate 1	FF1_H_630	Sonar (HMS)	13.11.2003 01:09:31	13.11.2003 01:31:18	00:21:47	56	69,45256	69,46127	16,67623	16,71143
☑	Frigate 1	FF1_H_914	Sonar (HMS)	13.11.2003 01:09:55	13.11.2003 01:18:02	00:08:07	21	69,39024	69,41672	16,58472	16,60178
☑	Frigate 1	FF1_H_1019	Sonar (HMS)	13.11.2003 01:09:55	13.11.2003 01:18:27	00:08:32	22	69,30354	69,31182	16,69822	16,73101
☑	Frigate 1	FF1_H_1223	Sonar (HMS)	13.11.2003 01:10:19	13.11.2003 01:22:36	00:12:17	31	69,41457	69,44073	16,52188	16,5483
☑	Frigate 1	FF1_H_1309	Sonar (HMS)	13.11.2003 01:10:19	13.11.2003 01:33:52	00:23:33	63	69,35664	69,37557	16,78041	16,79072
☑	Frigate 1	FF1_H_2200	Sonar (HMS)	13.11.2003 01:11:55	13.11.2003 01:22:10	00:10:15	26	69,41321	69,41641	16,81884	16,8235
☑	Frigate 1	FF1_H_2402	Sonar (HMS)	13.11.2003 01:12:19	13.11.2003 01:45:05	00:32:46	99	69,30823	69,31486	16,71629	16,74218

Show	Unit name	Type	Start time (Z)	Stop time (Z)	Duration	Length	Min latitude	Max latitude	Min longitude	Max longitude
☑	Frigate 1	GPS	13.11.2003 00:55:02	13.11.2003 02:02:14	01:07:12.070	4033	69,32615	69,39034	16,48611	16,67967
☑	Frigate 2	GPS	13.11.2003 00:55:20	13.11.2003 02:05:41	01:10:21.080	4222	69,24967	69,36101	16,58324	16,77215
☑	Submarine 1	DACULA	13.11.2003 01:00:12	13.11.2003 02:07:54	01:07:41.219	4062	69,33192	69,35301	16,67408	16,76954

Figure 8.1 The Track table in SIMSON Fennikel

A description of the data columns are given in Appendix B.

8.1 Table navigation

The table is divided into four parts;

- A drop-down list
- A track data display
- A reference data display
- A weapon data display

The drop-down list

If there are several track sets selected in the *ASW* window, these data sets can be switched between from the drop-down list in the top of the application.

General information for the displays

Beneath the drop-down list we find the tracks and reference trajectories with various information listed in each row. The *show* column is used to show or hide a track, or a reference trajectory, on the map in Maria.

Right click on the column header to display a column context menu where columns can be included or excluded, see Figure 8.2. To reorder columns, left click and hold on a column and drag it to a new location.

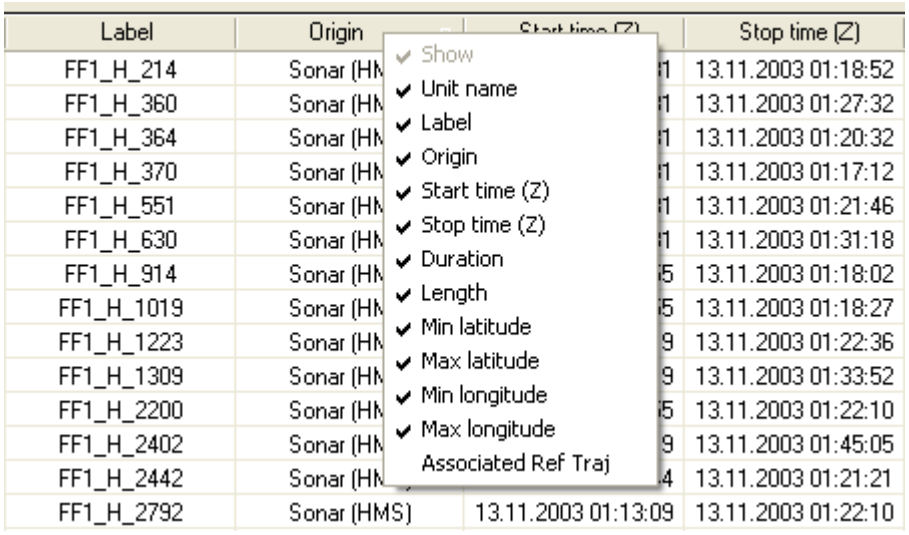


Figure 8.2 The column context menu in the Track table

Right clicking in one of the rows containing data reveals a new row context menu, see Figure 8.3.

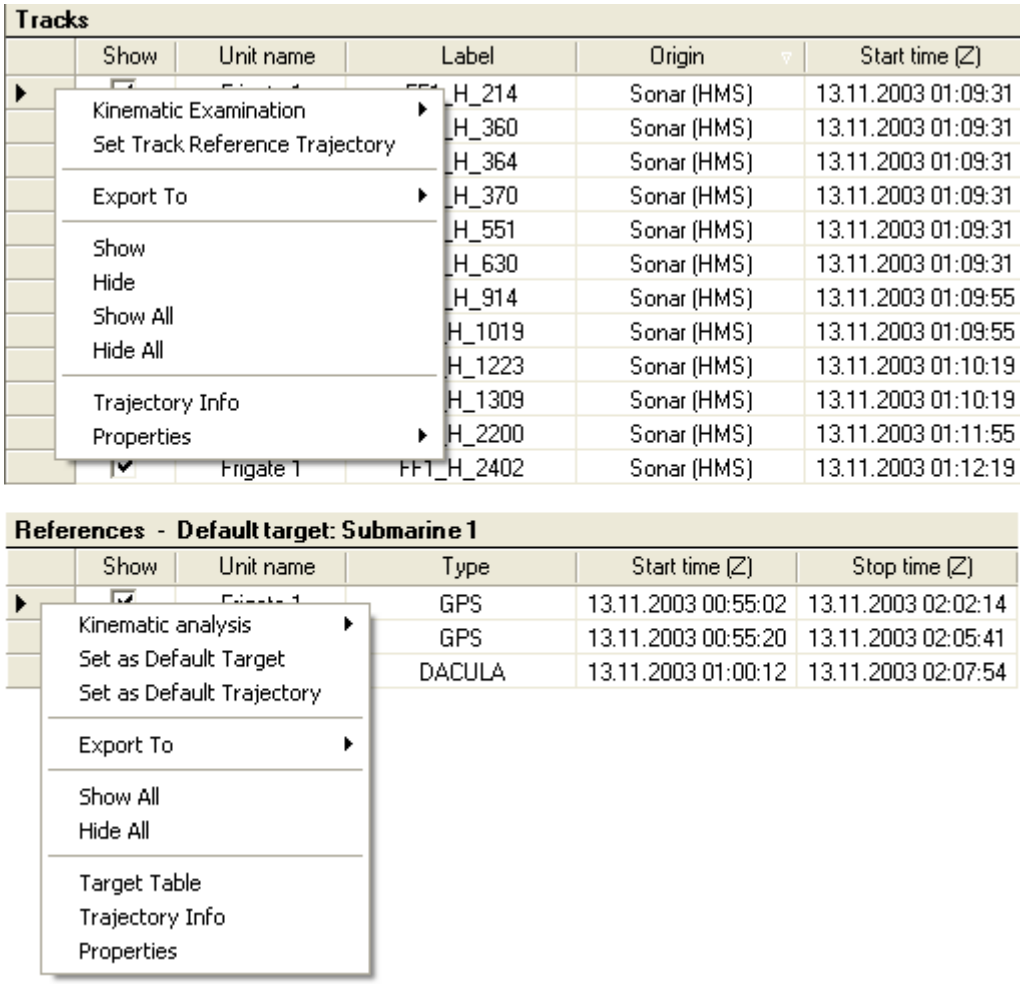


Figure 8.3 The row context menus in the Track table

Row context menu in the track data display

- By clicking *Kinematic Examination* → *New* in the context menu, a set of default technical plots are displayed in Matlab. These will be described in detail in the Technical Plots section 11.3.
- By clicking Set Track Reference Trajectory, a reference trajectory is associated with a track. This is further described in section 8.2.
- By clicking *Export To* → *Excel*, all data for the selected row is ready to be pasted into Excel for further analysis.
- By clicking *Show*, the chosen tracks are displayed in Maria. *Hide* hides the chosen tracks from being visualized in Maria.
- By clicking *Show All*, all tracks in the *Track Table* are displayed in Maria. *Hide All* hides all tracks in the *Track table* from visualization in Maria.
- By clicking *Trajectory Info*, a new window will open containing detailed information about a trajectory's observations. This is further described in section 8.4.
- By clicking Properties, properties can be set on for a track, for selected tracks or on origin level. This is further described in section 8.3.

Row context menu in the reference data display

- By clicking *Kinematic Examination* → *New* in the context menu, a set of default technical plots are displayed in Matlab. These will be described in detail in the Technical Plots section 11.3.
- *Set as Default Target* sets the selected navigation data to represent the target in the exercise. The default target is used as a reference in kinematic analysis on sensor tracks. To change the default target, right click a reference and select *Set as Default Target*.
- As a platform may have multiple reference trajectories, only one of them can be set as the default trajectory. The default trajectory is used as the sensor trajectory in the kinematic analysis. To change the default trajectory for a platform, right click the reference trajectory that should be the new default and select *Set as Default Trajectory*. To see which trajectory is the default one, right click the columns and check the *Default* column.
- By clicking *Export To* → *Excel*, all data for the selected row is ready to be pasted into Excel for further analysis.
- By clicking *Show All*, all reference trajectories in the *Track Table* are displayed in Maria. *Hide All* hides all reference trajectories in the *Track table* from visualization in Maria.
- By clicking *Target Table*, bearing and range from own unit to other units can be viewed. This is further described in section 8.5.
- By clicking *Trajectory Info*, a new window will open containing detailed information about a trajectory's observations. This is further described in section 8.4.
- By clicking *Properties*, properties for a reference trajectory can be set. This is further described in section 8.3.

The weapon data display

This part of the track table is not in use for the current version of Simson Fennikel.

8.2 Associate reference trajectory

Obsolete functionality related to torpedo simulation.

8.3 Set properties

To **change the properties of a single track**, select a track in the track data display. Right click and select:

Properties → *Track properties*

A properties window for tracks on track level is now displayed, see Figure 8.4.

To **change the properties for multiple tracks**, mark the tracks with either *Ctrl+left click* or *Shift+left click* in the grey column to the left. Then select:

Properties → *Track properties*

A properties window for tracks on track level is now displayed, but the properties set here will be valid for all selected tracks.

To **change the properties of multiple tracks belonging to the same origin**, select a track in the track data display. Right click and select:

Properties → Origin properties

A properties window for tracks on origin level is now displayed, see Figure 8.4.

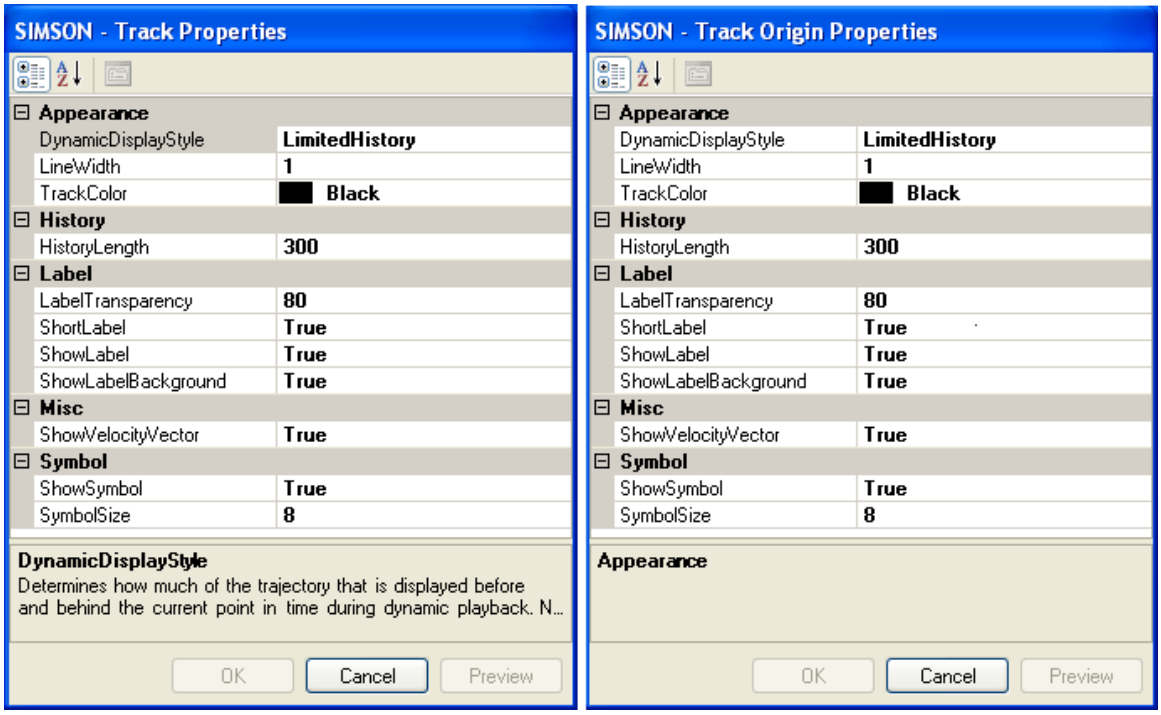


Figure 8.4 Track properties on track and origin level

To **change the properties of a platform trajectory**, select a platform in the reference data display. Right click and select *Properties*.

A properties window for reference trajectories on platform level is now displayed, see Figure 8.5.

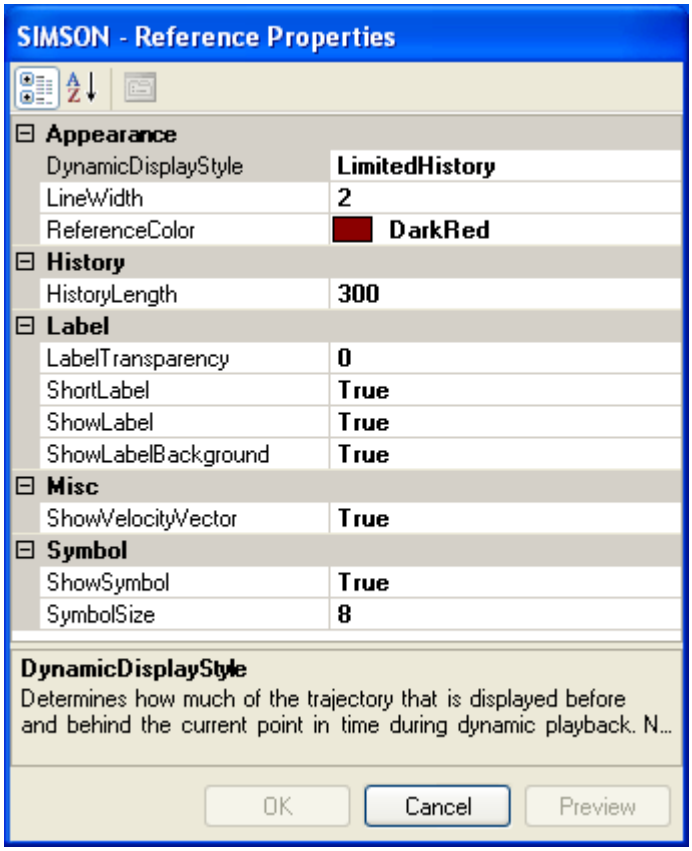


Figure 8.5 Reference properties

To preview the changes, click *Preview* in the properties windows. To accept the changes, click *OK*. If Cancel is clicked, no changes are made.

Section 12.2 gives a description of the properties.

8.4 The Observation browser window

The *Observation browser* display detailed information about a trajectory's observations. The observations can belong to tracks or platforms.
It is accessed from the *Track table.* Right click on a row in one of the displays, and select *Trajectory Info*. The *Observation browser* window is now displayed, see Figure 8.6.

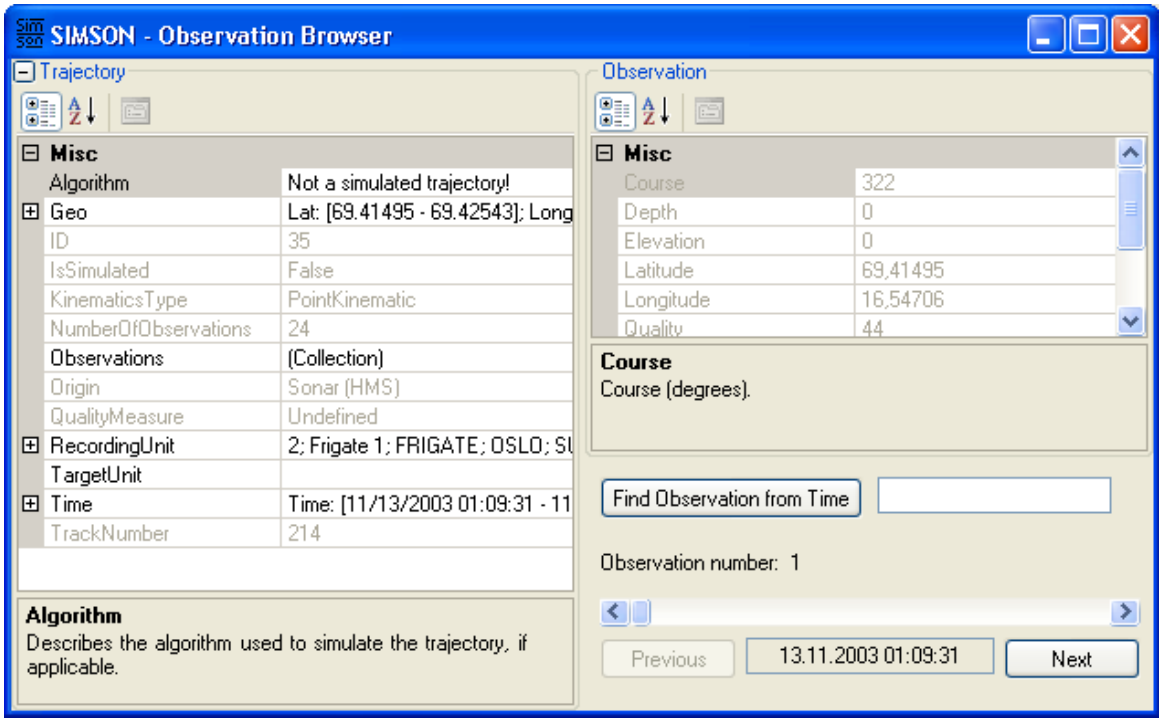


Figure 8.6 The Observation Browser in Simson Fennikel

Overall information about the trajectory is displayed to the left, and information one single observation is displayed to the right. To get information about the properties of an observation, select the property and a description will be displayed below the property list.

To hide *Trajectory information* section, press the minus sign in the upper left corner.

To find information about the observation property's next/previous change, if available, right click on a property and select *Get Next* or *Get Previous Change* respectively.
If the property can be plotted, select *Plot Property Values* and the property is plotted in Matlab, see Figure 8.7.

This is further described in Technical Plots section 11.4.

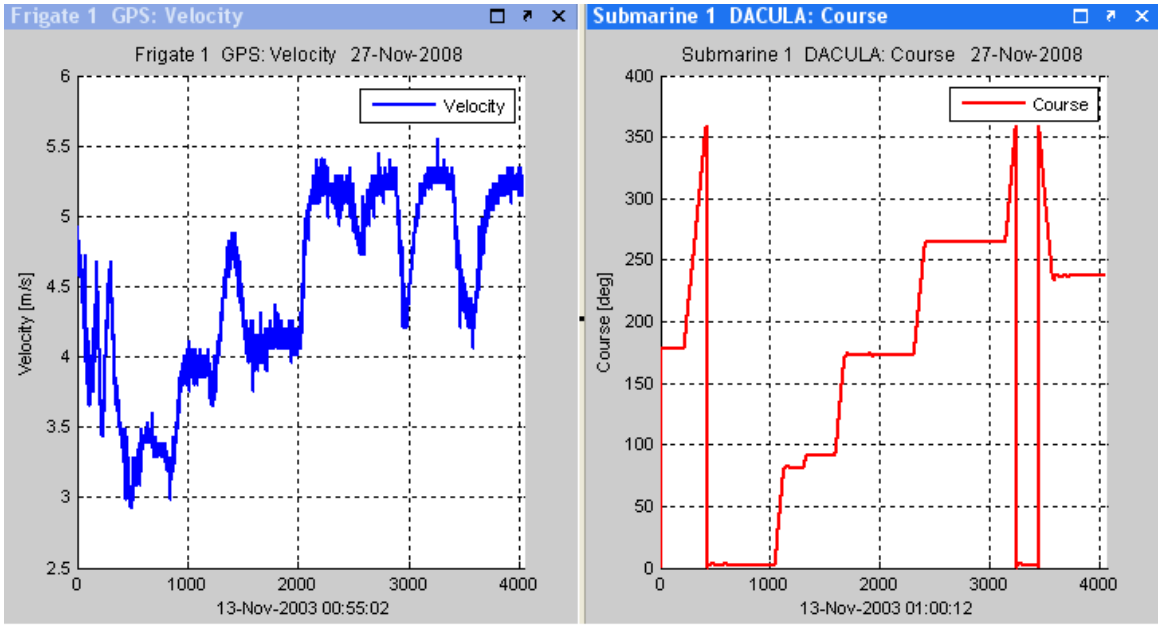


Figure 8.7 Matlab plots of Property Values from the Observation Browser

To iterative step through the trajectory observations:

- Click the Next button (right arrow) to move forward.
- Click the Previous button (left arrow) to move backwards.
- Use the slide bar to get the correct observation.

To find an observation closest to a specific point in time, type a time value in the textbox next to the button *Find Observation from Time*, then click the button itself.

8.5 The Target table

The Target Table can be used to view bearing and range from own unit to other units at different points in time, as well as course, velocity and depth/elevation for each unit.

In the *Track table*, right click on a reference and select Target table. Figure 8.8 shows our two platforms in the Target Table. To change own unit, right-click a reference and select *Set as Own Unit*.

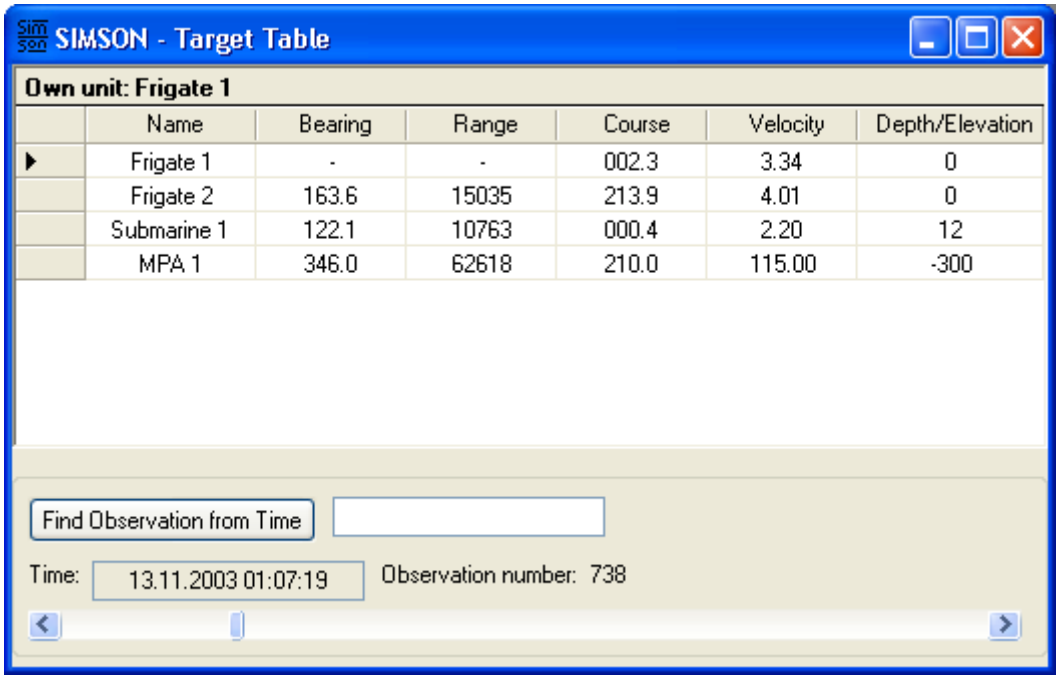


Figure 8.8 Target Table in SIMSON Fennikel

To step through observations, following possibilities are available:

- Click the Next button (right arrow) to move forward.
- Click the Previous button (left arrow) to move backwards.
- Use the slide bar to get the correct observation.

To find an observation closest to a specific point in time, type a time value in the textbox next to the button *Find Observation from Time*, then click the button itself.

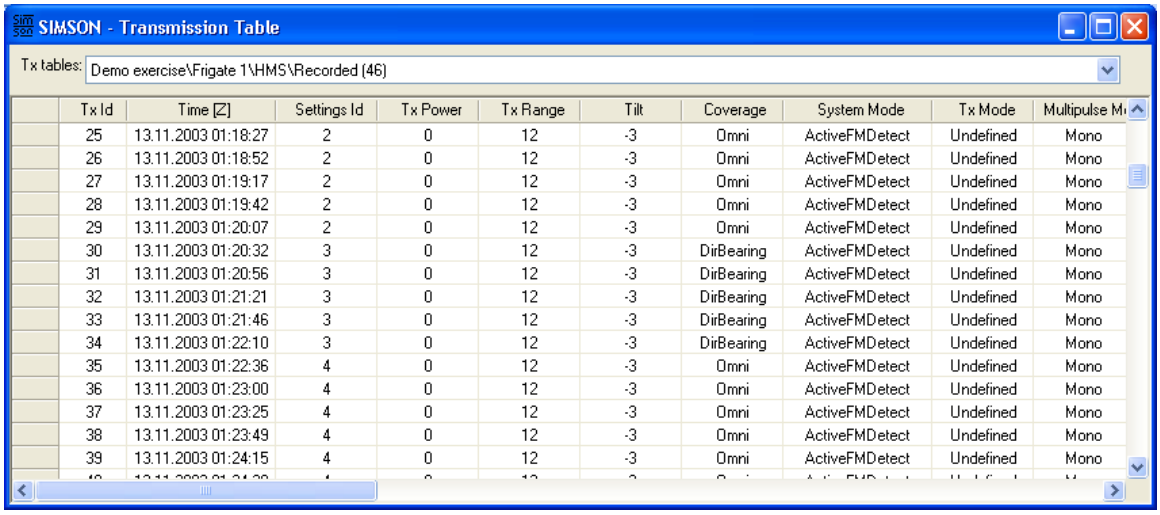
During Dynamic playback, own unit's observations are stepped through if the table is opened before the playback is started. Dynamic playback is described in chapter 6.

9 Simson menu: The transmission table

Transmissions are displayed in the *Transmission table* window. It contains a drop-down list and a table. The drop-down list enables selection between selected data, and the table contains data for each single transmission. The *Transmission table* window is placed in the Simson menu on the top of the screen:

Simson → Transmission table

Please note that the transmissions to be viewed in the transmission table must first be selected in the *ASW* window as a *Sonar detection* data set. Figure 9.1 shows the transmission table for transmissions from our exercise.



Tx Id	Time [Z]	Settings Id	Tx Power	Tx Range	Tilt	Coverage	System Mode	Tx Mode	Multipulse M
25	13.11.2003 01:18:27	2	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
26	13.11.2003 01:18:52	2	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
27	13.11.2003 01:19:17	2	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
28	13.11.2003 01:19:42	2	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
29	13.11.2003 01:20:07	2	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
30	13.11.2003 01:20:32	3	0	12	-3	DirBearing	ActiveFMDetect	Undefined	Mono
31	13.11.2003 01:20:56	3	0	12	-3	DirBearing	ActiveFMDetect	Undefined	Mono
32	13.11.2003 01:21:21	3	0	12	-3	DirBearing	ActiveFMDetect	Undefined	Mono
33	13.11.2003 01:21:46	3	0	12	-3	DirBearing	ActiveFMDetect	Undefined	Mono
34	13.11.2003 01:22:10	3	0	12	-3	DirBearing	ActiveFMDetect	Undefined	Mono
35	13.11.2003 01:22:36	4	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
36	13.11.2003 01:23:00	4	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
37	13.11.2003 01:23:25	4	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
38	13.11.2003 01:23:49	4	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono
39	13.11.2003 01:24:15	4	0	12	-3	Omni	ActiveFMDetect	Undefined	Mono

Figure 9.1 The transmission table in Simson Fennikel

A description of the data columns are given in Appendix B.

9.1 Table navigation

The table is divided into two parts;

- A drop-down list
- A transmission data display

The drop-down list

If there is multiple *Sonar detection* data selected in the *ASW* window, these data sets can be switched between from the drop-down list in the top of the application. The transmission types may be transmissions from HMS and ATAS.

The transmission data display

Beneath the drop-down list we find the table which contains various information for each transmission.

Right click on the column headers to display a column context menu where columns can be included or excluded, see Figure 9.2. To reorder columns, left click and hold on a column and drag it to a new location.

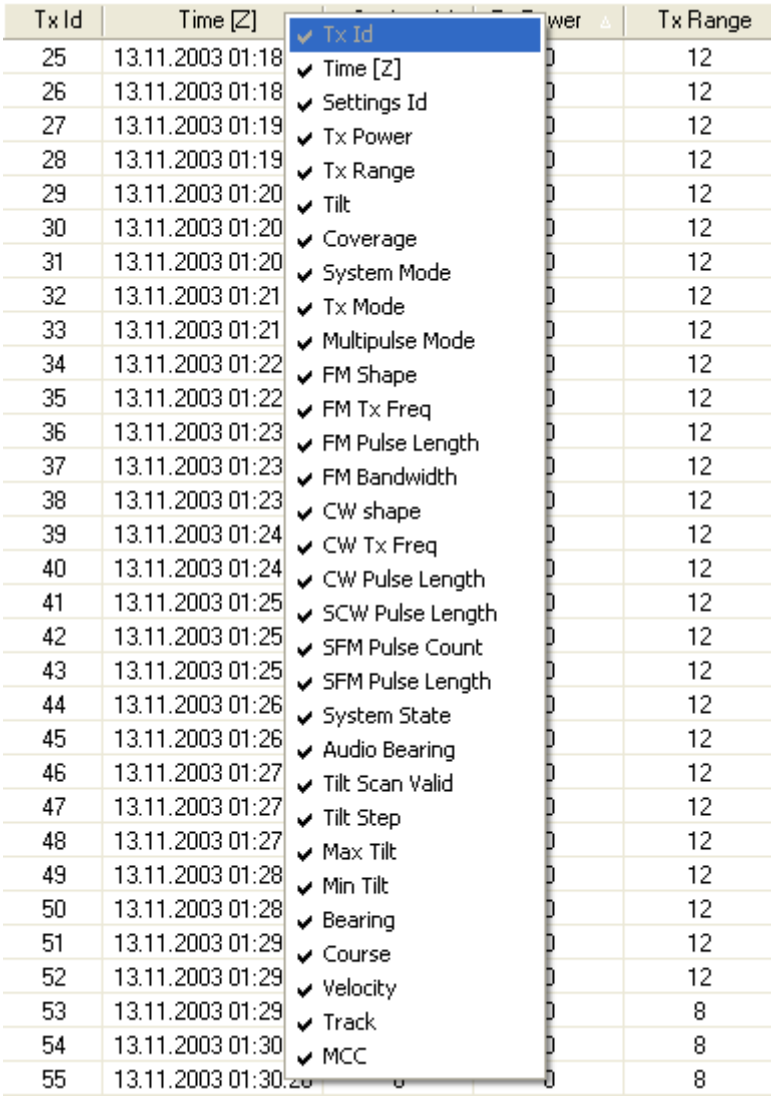


Figure 9.2 The column context menu in the Transmission table

Right clicking the rows reveals the row context menu, see Figure 9.3.

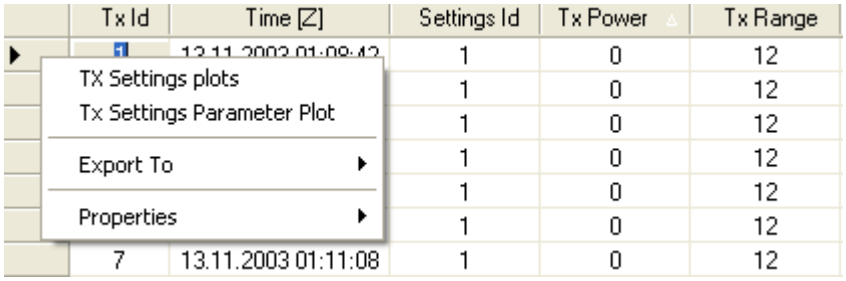


Figure 9.3 The row context menu in the Transmission table

Context menu

- *Tx Settings plots or Tx Setting Parameter Plot*, plots for sonar settings are displayed in Matlab. These are further described in Technical Plots section 11.5.
- *Export To* → *Excel*-option copies all data in the table to the clip board, and becomes ready to be pasted into Excel.
- *Properties*-option enables the user to set the visualization properties for either a single or multiple transmissions. The *Origin Properties* is equal of selecting all rows. The *Properties*-option is further described in section 9.2.

9.2 Set properties

The properties for the transmissions can be set in different ways:

- To change the properties for a single transmission, select a transmission.
  Right click and select: *Properties* → *Tx Properties*.
- To change the properties for multiple transmissions, select the transmissions using the Shift or Ctrl keys.
  Right click and select *Properties* → *Tx Properties*.
- To change the properties for all transmissions in the list,
  right click and select *Properties* → *Origin Properties*.

The properties window for tracks on track or origin level is displayed in Figure 9.4.

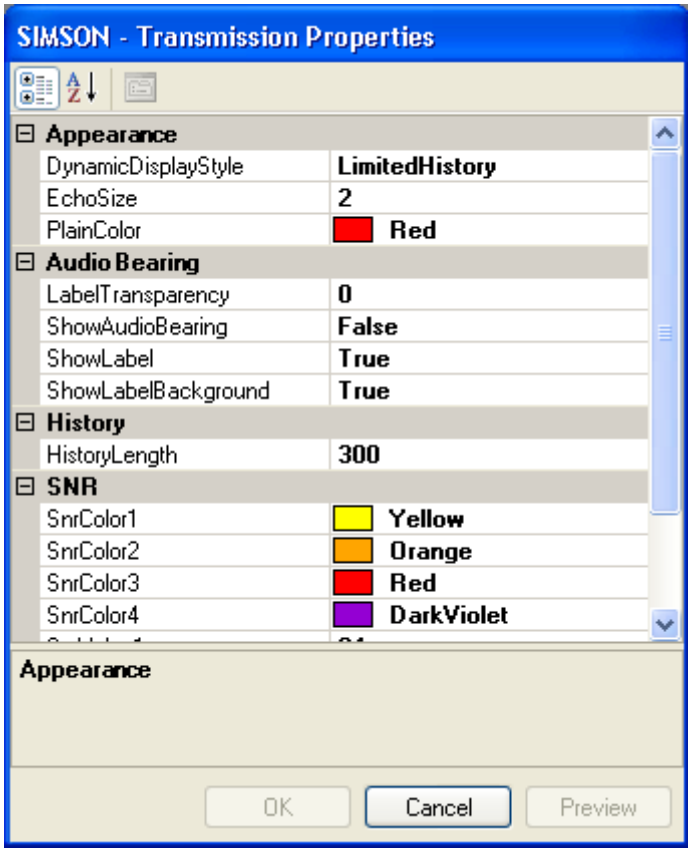


Figure 9.4 Transmission properties on track or origin level

Section 12.4 gives a description of the properties.

9.3 Audio bearing

To get information about where the sonar operator has focused the audio beam, audio bearings can be displayed. To show the audio bearings, set the property *ShowAudioBearing* to true. The property can be set on three levels;

- On Tx level, see section 9.2.
- On Origin level, see section 9.2.
- On Global level, see global properties in section 12.4.

This will show the audio bearing for each transmission at transmission time. Figure 9.5 displays audio bearings during a dynamic playback. Here we have set *ShowAudioBearing* to true on Global level.

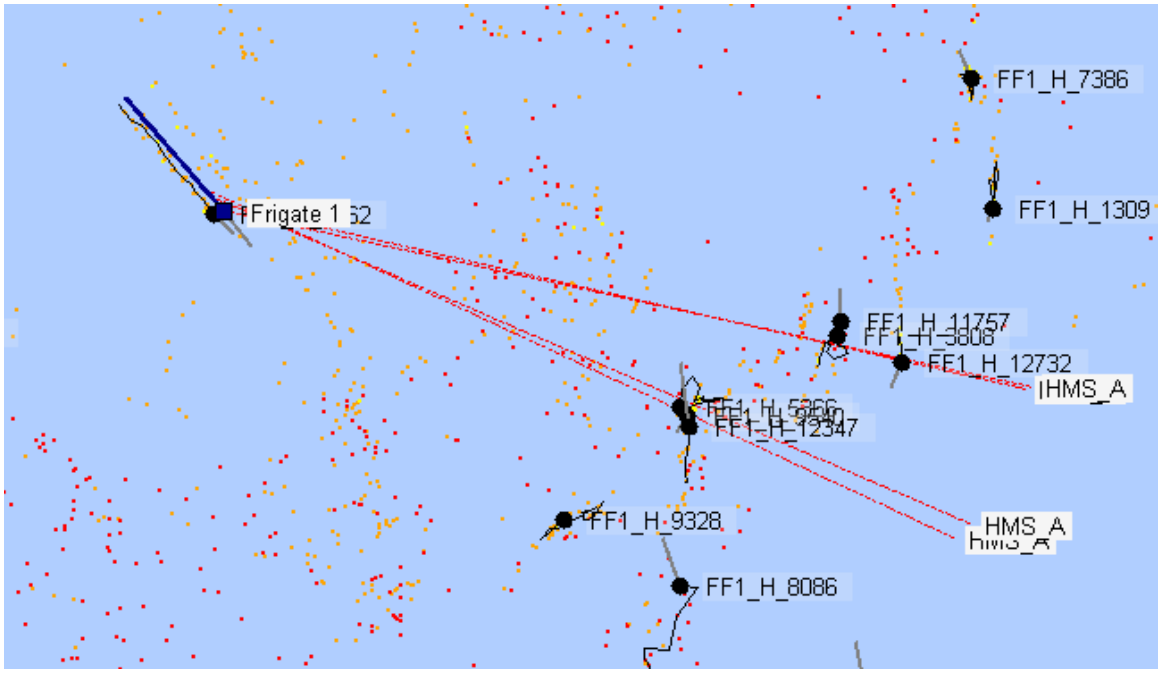


Figure 9.5 Audio bearings for transmissions in Simson Fennikel

10 Simson menu: The event viewer

Events are recorded during an exercise, either as hand written notes or automatic generated logs. Special situations, voice communications, combat system changes and other analysis relevant elements are called events, and are displayed in the *Event Viewer*. This functionality is accessed through the *Simson* menu:

Simson → *Event Viewer*

Figure 10.1 shows the Event Viewer for our exercise.

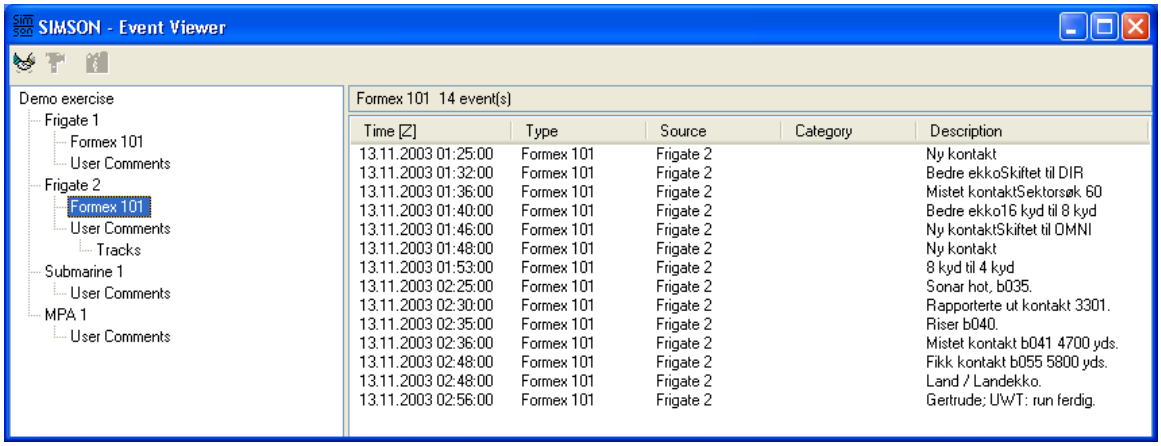


Figure 10.1 The Event Viewer in Simson Fennikel

10.1 The user interface

The user interface is divided into two parts;

- A tree-view to the left side, which lists units and event types within the exercise.
- A table to the right, which lists all the events for the selection chosen in the tree-view sorted ascending on time.

When a new event type is selected, any events to the right are removed and the new events are listed.

- To prevent previous events from being removed, click the first button on the toolbar (see Figure 10.2). Events will then be merged with the event list until the same button is pressed again.
- To set the dynamic time for playback, chapter 6, click the second button on the toolbar.
- To create User Comment, click the *User Comments* entry connected to one of the platforms in the tree-view and click the third button to the right. This is further described in section 10.3.

Figure 10.2 Toolbar buttons in the Event Viewer

To export the event list to Excel, right click in the event list and select:

Export List To → Excel

Dynamic playback

By selecting an event in the event list and clicking on the second button in the toolbar, the dynamic playback time is set to the event's time.
The list of events to the right is stepped through during dynamic playback and the items are highlighted.

10.2 Event properties

To open the properties dialogue, double click an event. A window with two tabs will be displayed, see Figure 10.3:

- An *Event* tab with buttons to view attachments defined in the *Attachment* tab and arrow buttons which move focus to the next or previous event in the list.
- An *Attachment* tab with possibilities to attach an image, a video and/or a sound.

If an exercise contains Operator Actions, an additional button is available in the properties dialogue, *View XML*. Press this button to display the operator action event in a tree-view.

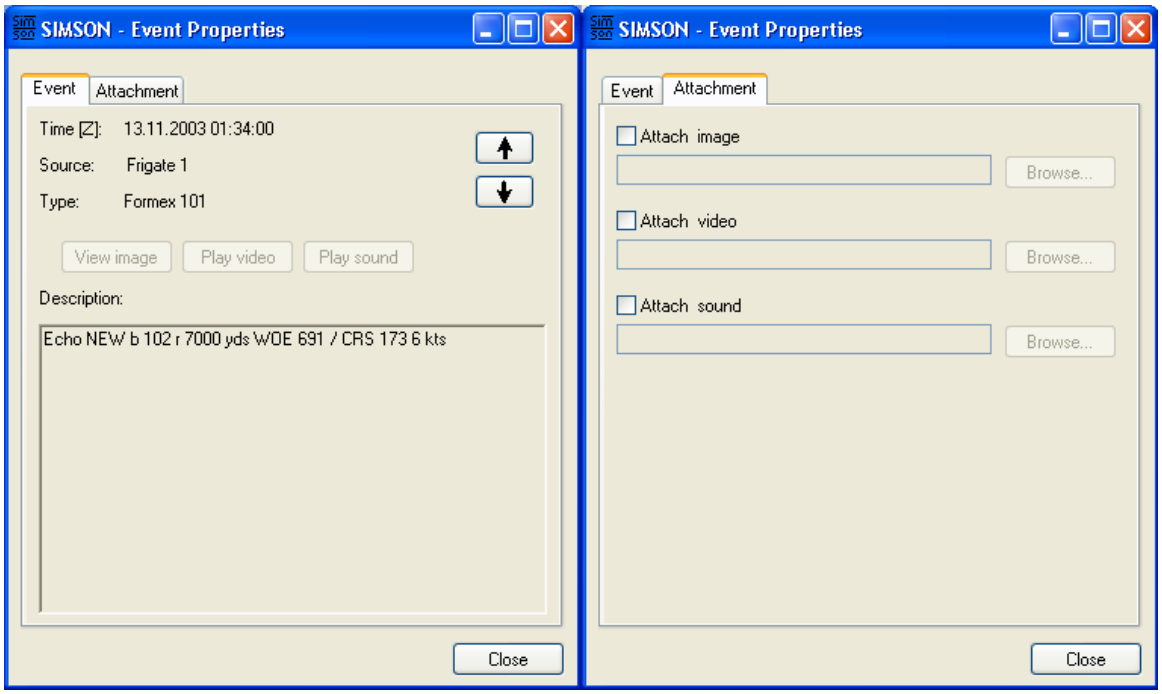


Figure 10.3 Event Properties in Simson Fennikel

10.3 User comments

To add a user comment, select the *User Comments* entry connected to one of the platforms in the tree-view and click the third button to the right on the toolbar. A new window is now displayed, see Figure 10.4.

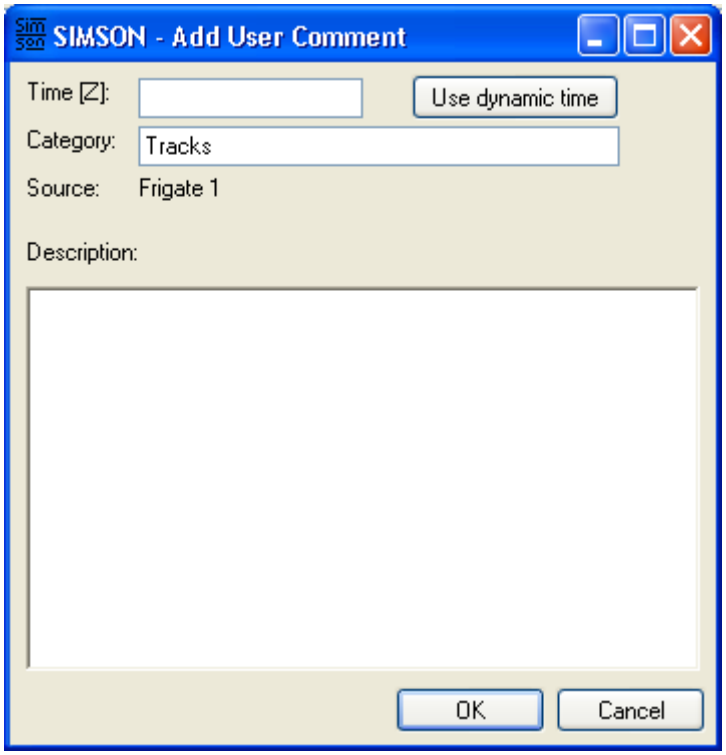


Figure 10.4 The User Comments window accessed from the Event Viewer

There are two choices, either to add a user comment to a new category or to add a user comment to an existing category.

To add a user comment to a new category:

1. Fill in time or click *Use dynamic time* (from dynamic playback).
2. Fill in a category that groups the user comments together.
3. Write the description text.
4. Click *OK*.

To add a user comment to an existing category:

1. Fill in time or click *Use dynamic time* (from dynamic playback).
2. Write the description text.
3. Click *OK*.

To export events to *Excel*, right click on an event and select *Export List To* and *Excel*.

To edit the description of a user comment, right click on a user comment and select *Edit*.

To delete a user comment, right click on a user comment and select *Delete*. The various options are displayed in Figure 10.5; please note that the latter two options are valid for user comment only.

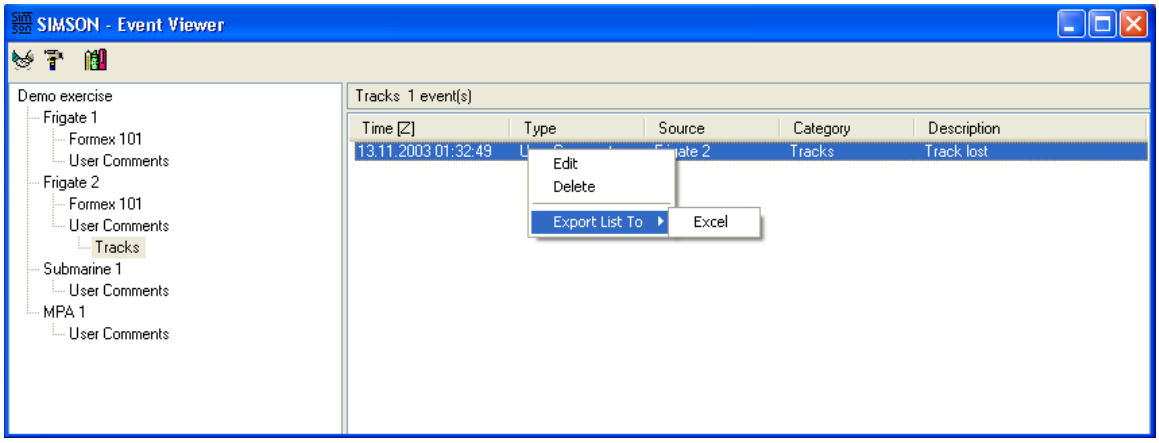


Figure 10.5 The Event Viewer with the context menu for an event

11 Simson menu: Technical Plots

Technical plots in Simson Fennikel are basically properties along a time line. In addition, regular Cartesian plots are available. These have their origin in the start position of the *Default Trajectory*, see section 8.1.
The application Matlab [2] is used to draw the plots and to perform the necessary calculations, see Figure 11.1.

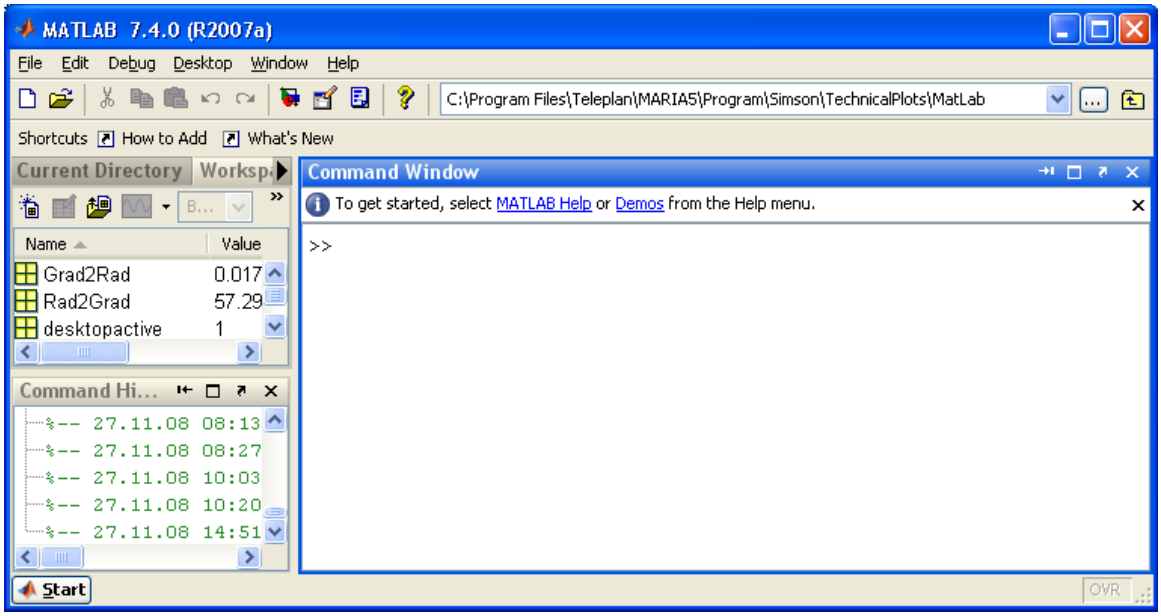


Figure 11.1 The window from the application Matlab which is started together with Simson Fennikel

Technical plots can be generated by:

- Automatic generation from context menus in the *Track table*, described in section 11.3, the *Observation Browser*, described in section 11.4, and the *Transmission table*, described in section 11.5.
- Interactive generation from a separate *Technical Plot* window available in the *Simson* menu described in sections 11.1 and 11.6.

In addition to drawing static plots, a dynamic type of presentation is supported during Dynamic Playback, see section 11.7.

Known issues

- Never close the Matlab window unless technical plot functions are not needed in the analysis session. If Matlab is unintentionally closed, restart Simson Fennikel to be able to utilize the functionality again.
- Occasionally, Matlab is sent a heavy workload from Simson Fennikel, and a window telling that the server is busy will eventually be displayed. This is due to a timeout in the

communication between Simson Fennikel and Matlab, and clicking the *Retry*-button will normally correct the problem.
In order to reduce this issue, both the number of displayed figures as well as the number of available figures in the Matlab window should be limited.

11.1 The Technical Plot window

There are several methods to create technical plots in Simson Fennikel, but an essential part in this concept is the *Technical Plot* window (TP window), see Figure 11.2. It is accessed by clicking *Simson* → *Technical Plots*.

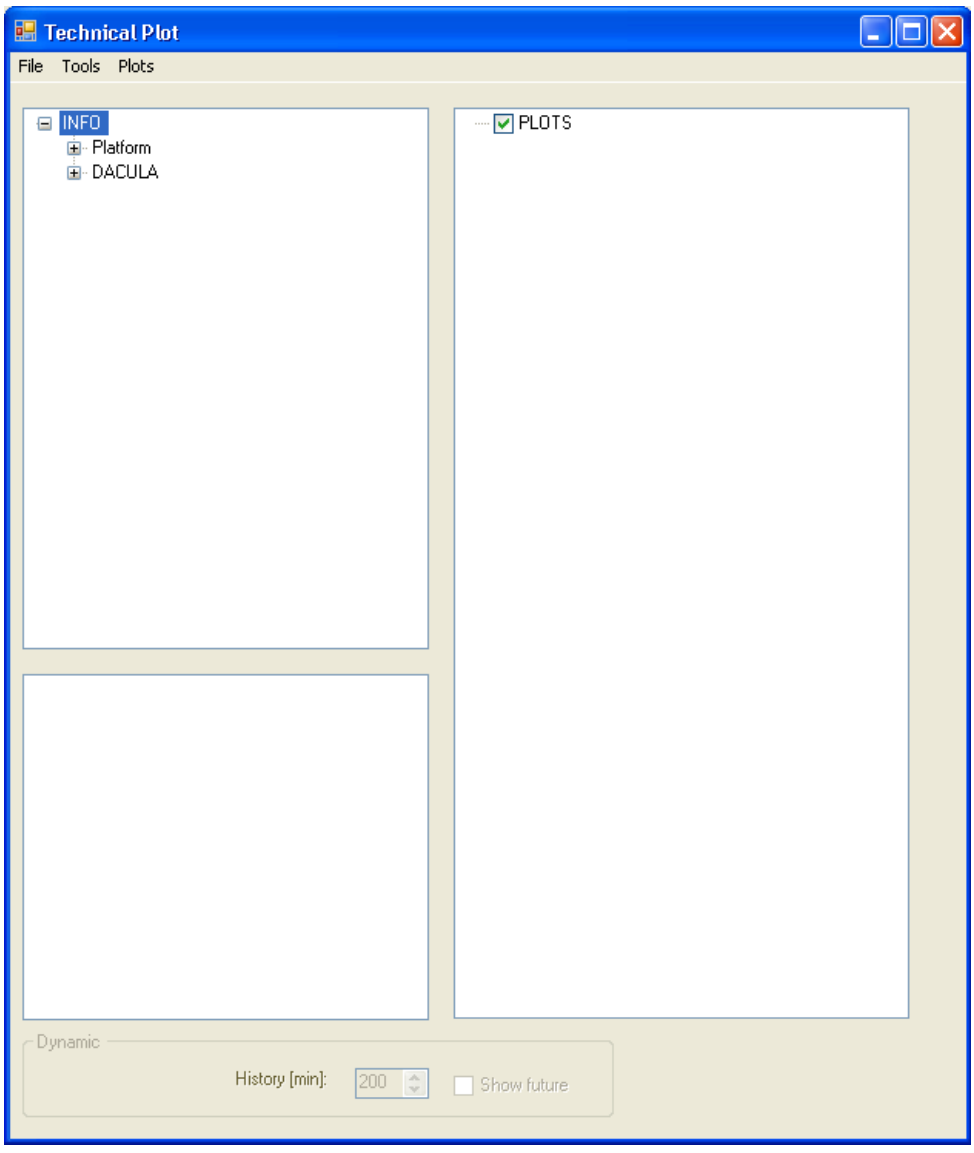


Figure 11.2 The Technical Plots window in Simson Fennikel (without plots)

This window is divided into three sections:

- Selection of information from various information groups to the upper left, for now only the platform data can be selected.
- A data variable list to the bottom left.
- Manipulation of plots to the right. This is empty in the example shown in Figure 11.2 but as soon as certain types of plots are created, these will be added here. The population of plots to manipulate will be described in the next sections and the manipulation of these plots is further described in section 11.6 (interactive generation).

To manipulate properties for the plots, click *File* → *Preferences*. This option is further described in section 11.6 (interactive generation).
To generate an exercise overview plot, click *Plots* → *Exercise overview*. This option is further described in section 11.2 (overview section).
To manipulate dynamic parameters use the section *Dynamic* in the bottom part of the window. This option is further described in section 11.7 (dynamic section).

11.2 Automatic Generation of exercise overview plots

If there exist many different datasets within the exercise's time frame and they are spread in time, it may be difficult to find the desired data. Simson Fennikel provides the possibility to plot an overview of where the data exist in time.

To generate a plot that gives an exercise overview, click *Simson* → *Technical Plots*. The *Technical Plots* window will be displayed. Click *Plots* → *Exercise overview* and a new Matlab window will be opened with a new plot, see Figure 11.3.

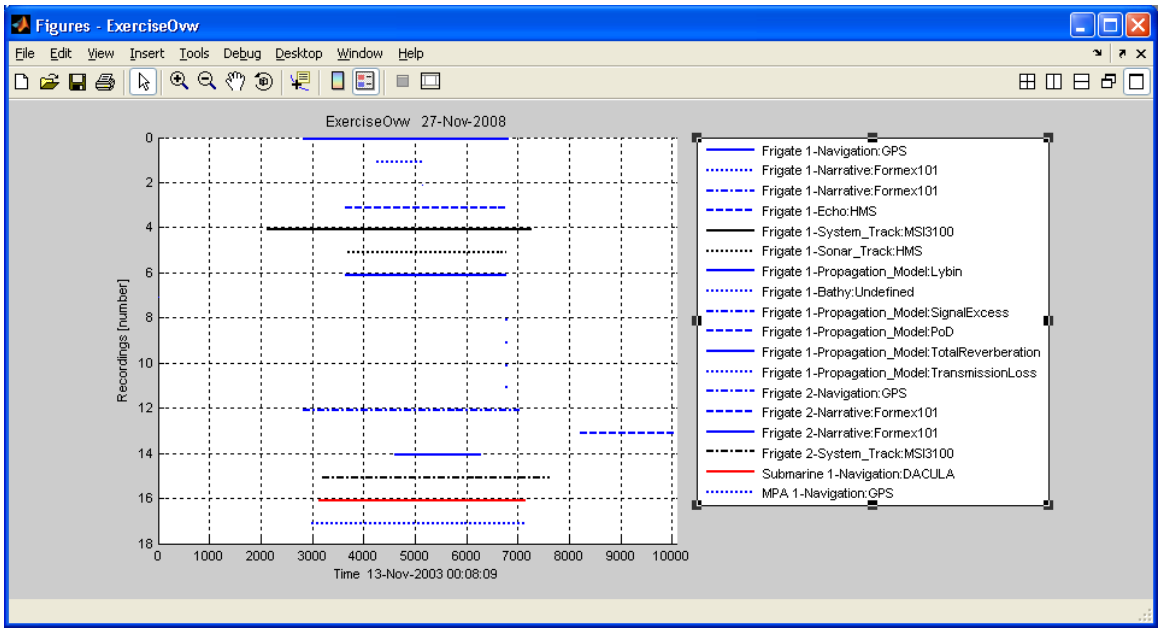


Figure 11.3 An exercise overview plot

The plot gives an overview of what data that is available in the exercise.

Please note that Matlab functions can be used to move or resize the legend box. To move the legend outside the plot, choose *Edit Plot* in the top menu (the "arrow" symbol), right click the legend box and choose *Location* → *Outside North East*. Go to [2] for extensive guides describing functionality in Matlab or use the help function accessed by the "?"- button in Matlab.

The *Time Calculator*, described in chapter 7, can be used to calculate the time corresponding to the seconds on the x-axis in the plot.

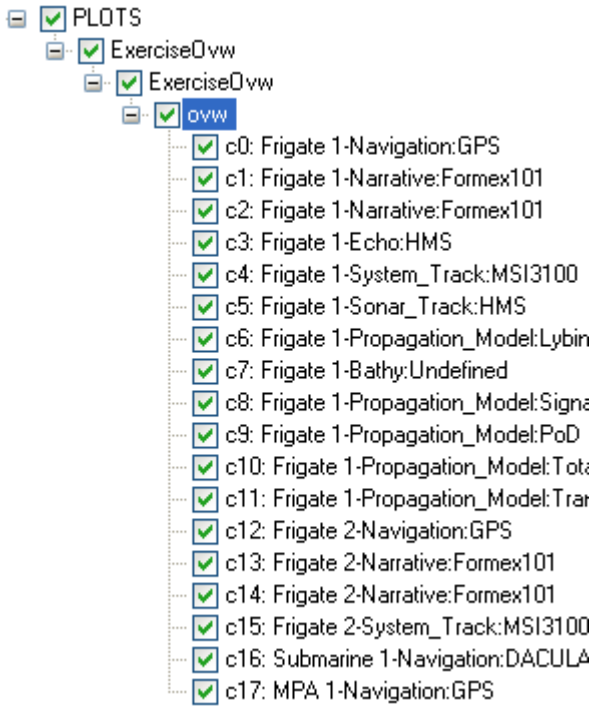


Figure 11.4 The Technical Plots window's plot tree after plotting an exercise overview

The exercise it now available in the TP window's plot tree, see Figure 11.4. One can now right click to access a context menu with the possibility to uncheck items, change properties or copy curves to other subplots. These options are further described in section 11.6 (interactive generation).

11.3 Automatic Generation of Target Kinematic Examination plots

To generate Target Kinematic Examination (TKE) plots, a track or a reference must be selected in the *track table* (described in chapter 8). Right click on a row and a row context menu with the alternative *Kinematic Examination* will be displayed, see Figure 11.5.

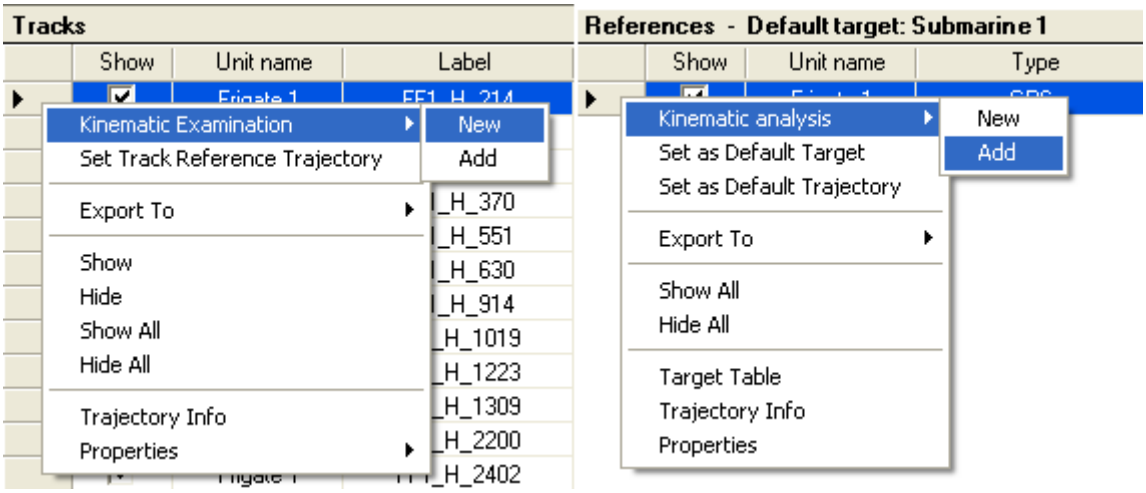


Figure 11.5 The track table with Kinematic Examination selected in track view and reference view respectively

By clicking Kinematic Examination → *New* for a reference, the following plots will be generated (see Figure 11.6):

- Position plot.
- Speed and Course plot.
- Depth plot, this plot is not applicable for surface platforms.
- Range and Bearing plot that plots the range and bearing relative to the default trajectory of the default target. If the exercise has a ship and a submarine, these plots will typically display the submarine's range and bearing relative to the ship.

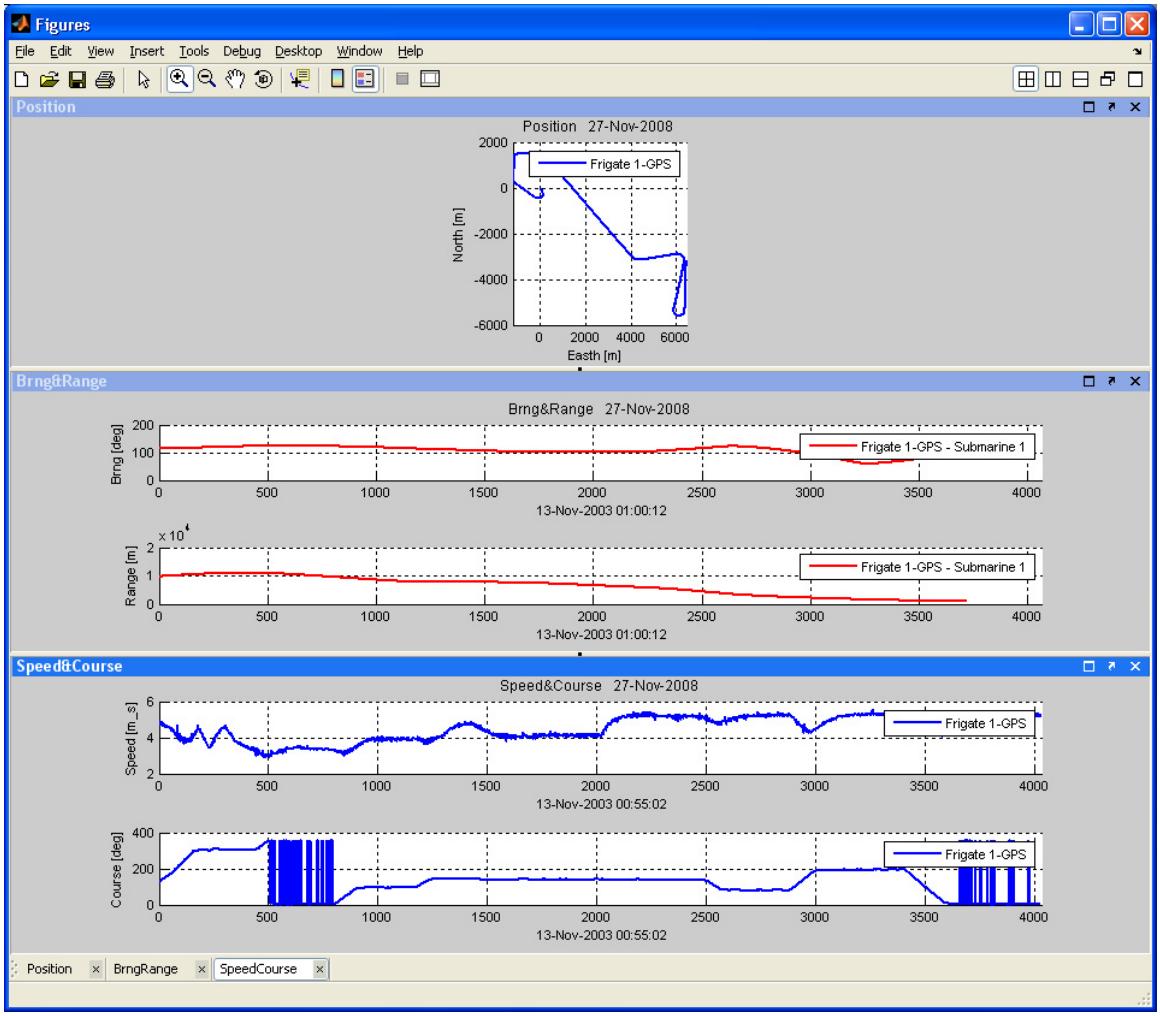


Figure 11.6 TKE plots for a reference

By clicking Kinematic Examination → *New* for a track, the following plots will be generated (see Figure 11.7):

- Position plot of track, track owner and target trajectories.
- Speed and Course plot of track, track owner and target trajectories.
- Speed and Course Error plot of track relative target.
- Depth plot for target trajectory, this plot is not applicable for surface platforms.
- Range and Bearing plot of track range/bearing and "true" range/bearing between track owner and target trajectories.
- Range and Bearing Error plot of track range/bearing and "true" range/bearing between track owner and target trajectories.

The target trajectory is defined as the associated track reference trajectory, which is the default trajectory of the default target if not set.
The owner trajectory is the default trajectory associated with the owner.

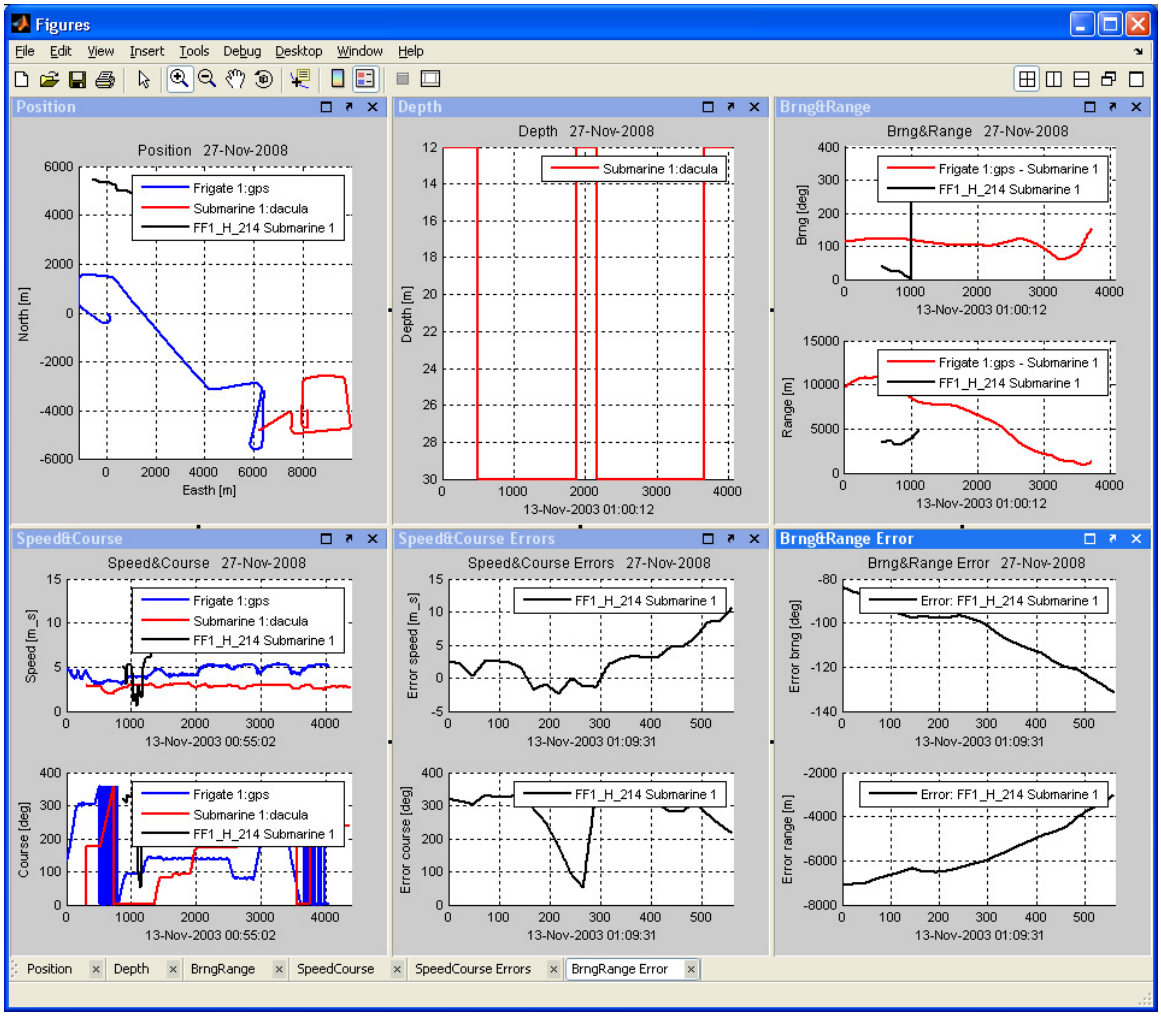


Figure 11.7 TKE plots for a track

Each time *Kinematic Examination* → *New* is selected, the content of the TKE plot group is cleared and new plots are generated.

To add more tracks or platforms in already existing TKE plots, mark the new track or platform and click *Kinematic Examination* → *Add*. Figure 11.8 shows plots where several tracks are included in the same plot group.

The TP window's plot tree is now populated with the new instances, see Figure 11.9.

To close TKE plots, use the "*x*-button in the top right corner of the Matlab figure container window.

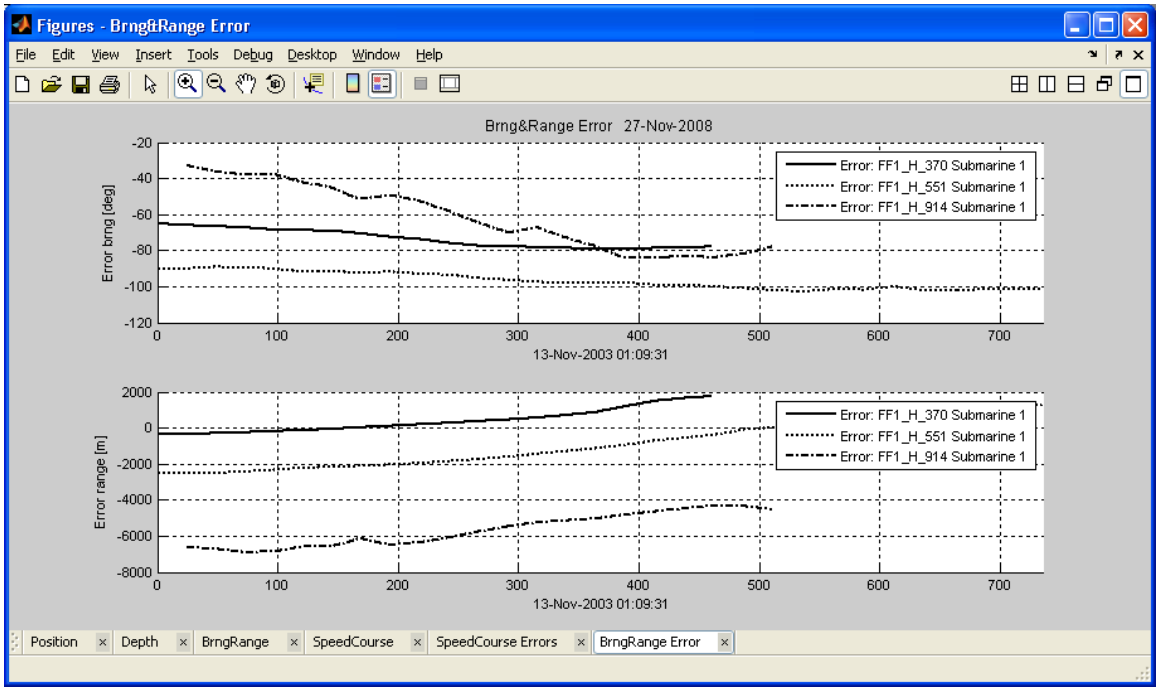


Figure 11.8 TKE plots for several tracks in one plot group

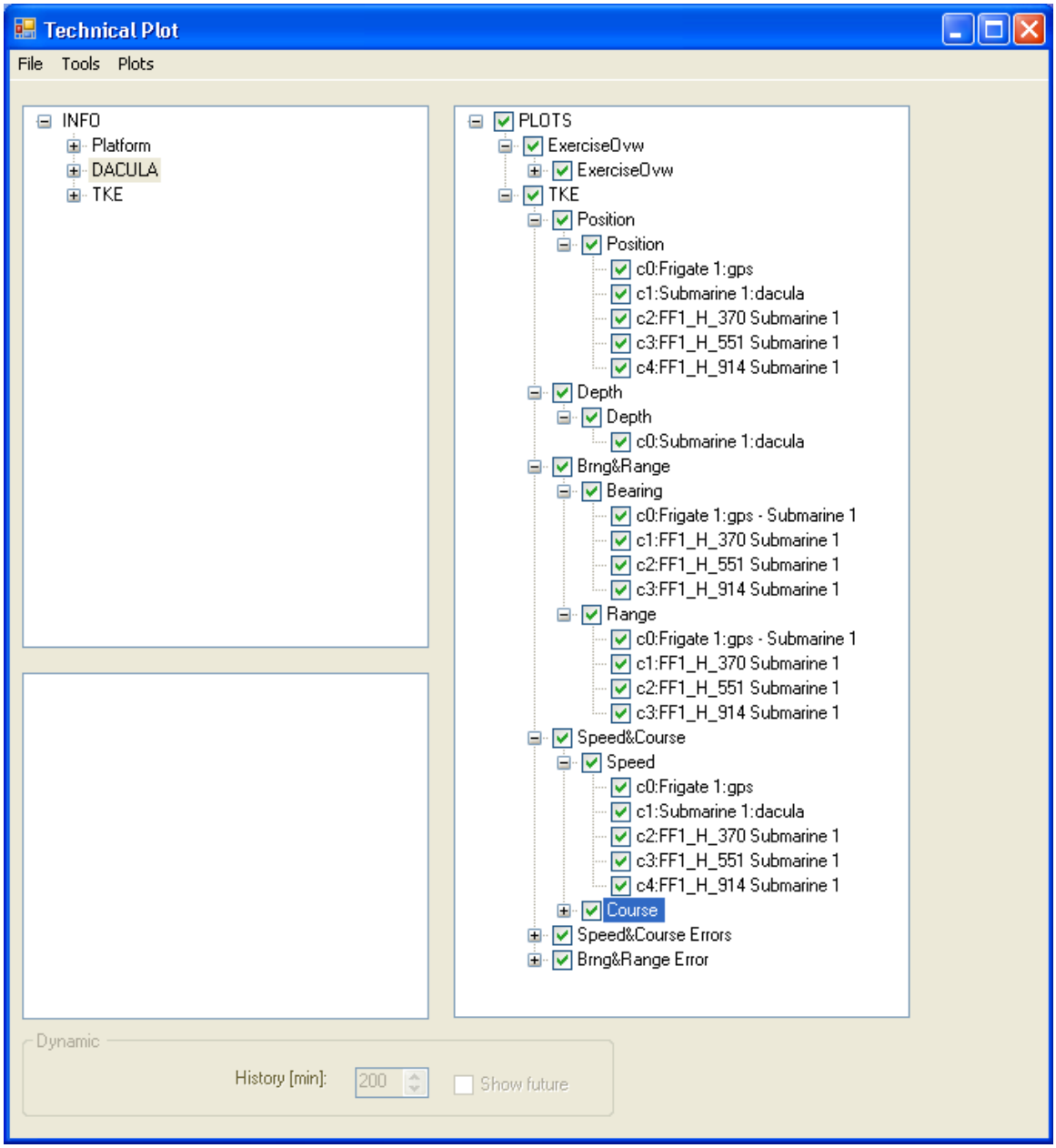


Figure 11.9 The Technical Plots window's plot tree after plotting of TKE plots

Appendix A describes more on how to alter the figure layout.

11.4 Automatic Generation of Observation Browser plots

A lot of properties describing a reference trajectory or a track can be plotted by using the Observation Browser (described in section 8.4).

To plot a property, select a property, right click to access the context menu and select *Plot Property Values*, see Figure 11.10. Please note that this function is not available for all properties.

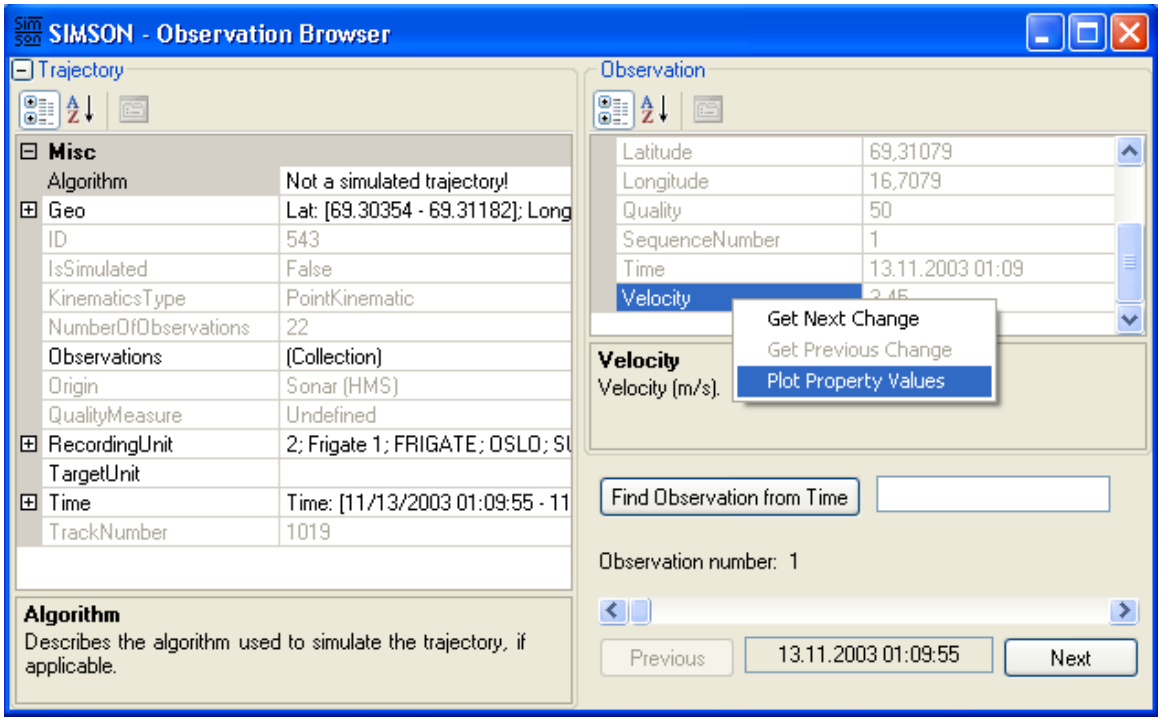


Figure 11.10 The Observation Browser with the context menu for a property plot

The plot is added to a new plot group named "User" in the TP window, see Figure 11.11. This makes it possible to generate a plot with curves for several parameters and to generate plots with information from other sources.

Figure 11.11 The Technical Plots window's plot tree after plotting properties

11.5 Automatic Generation of Sonar settings plots

Plots for sonar settings can be generated from a context menu in the *Transmission table* (described in chapter 9). There are two different kinds of plots that can be generated:

- *TX Setting plots* where predefined plots of a selected subset of parameters are generated. These parameters are: Beam dip, FM pulse length, FM TX frequency and Coverage.
- *Tx Setting Parameter Plot* where a plot of a selected parameter is generated.

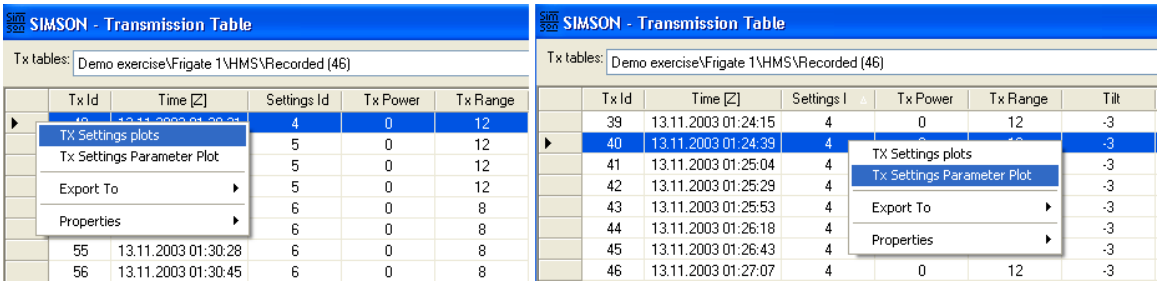


Figure 11.12 How to generate the settings plot types in the transmission table

To generate a *TX Setting* plot, right click in the grey column to the left, see Figure 11.12. Click *TX Setting plots* and a plot for the four parameters mentioned are displayed, see Figure 11.13.

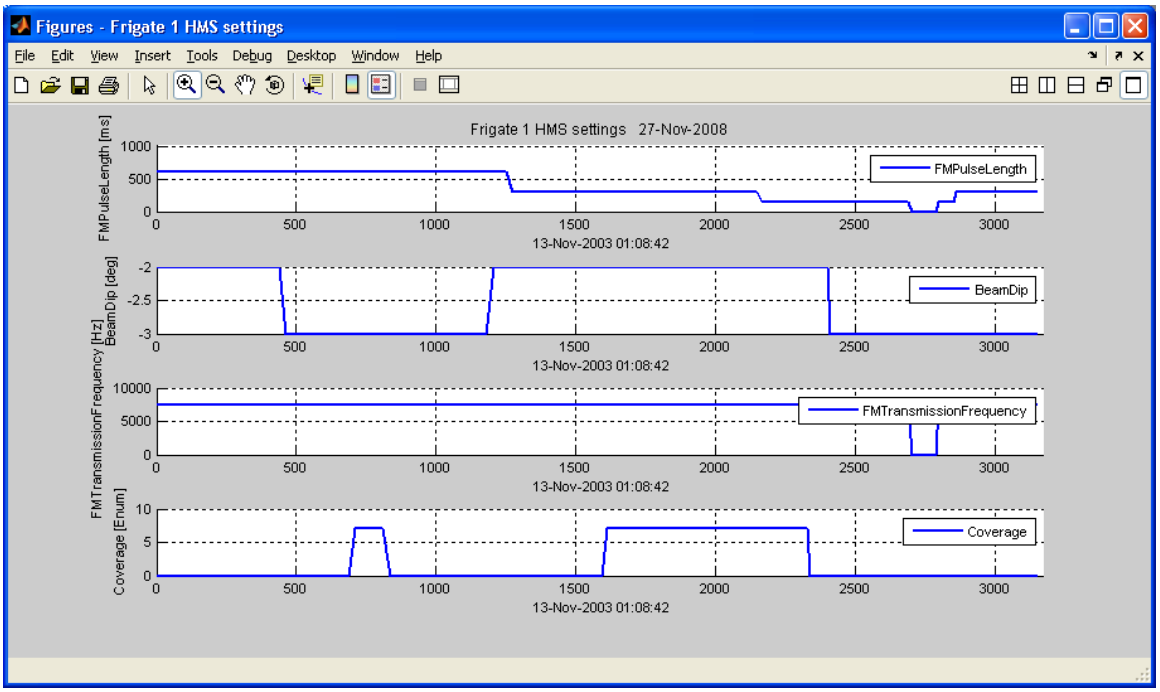


Figure 11.13 Tx setting plots in Simson Fennikel

To generate a *Tx Setting Parameter* Plot, choose a row by left clicking to the left of the desired one, see Figure 11.12 Then right click in the cell where the desired parameter reside. Click *Tx Setting plots* and a plot for the requested parameter is displayed, see Figure 11.14.

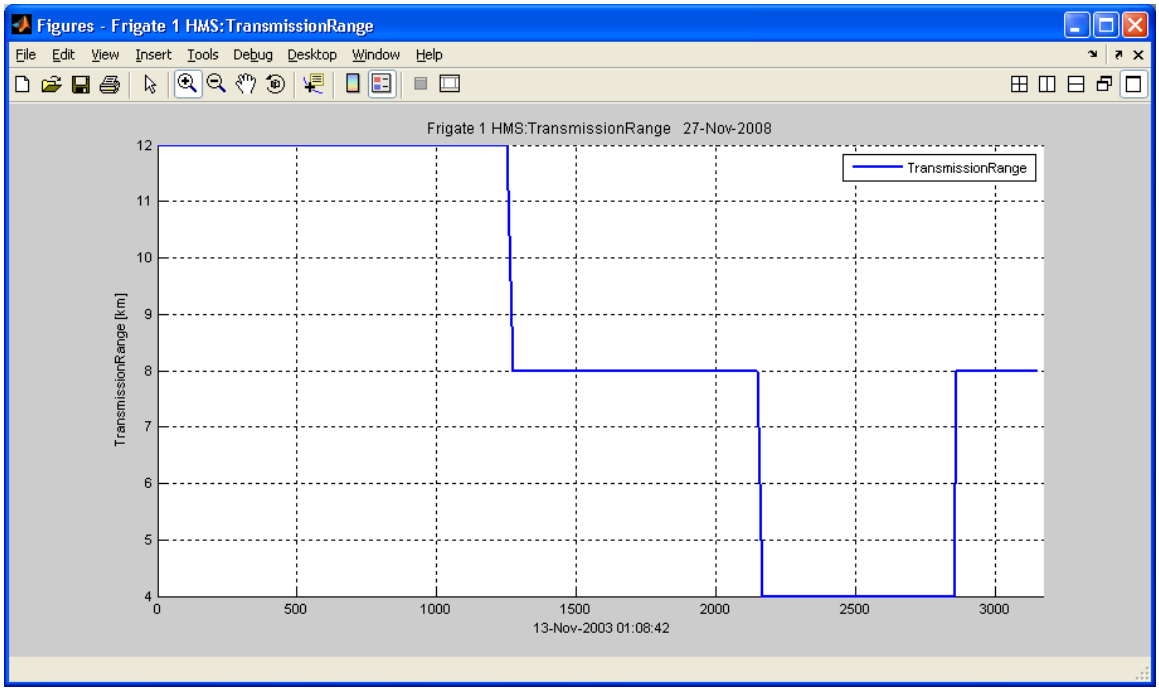


Figure 11.14 Tx Setting Parameter Plots in Simson Fennikel

The TP window is now populated with a new info group and a new plot group, both named "Sonar". This is displayed in Figure 11.15. Section 11.6 goes deeper into how the info groups and plot groups can be used further in the analysis.

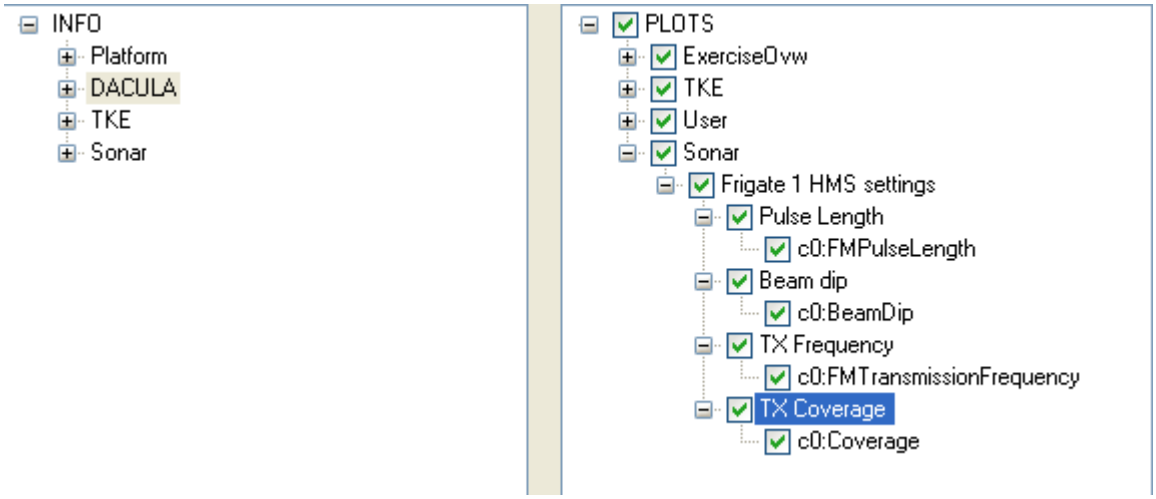


Figure 11.15 The Technical Plots window's plot tree after plotting of sonar settings

11.6 Interactive generation of plots

The interactive generation of plots is controlled from the Technical Plot window. Figure 11.16 shows a Technical Plots window with various plots ready to be interactively manipulated to the right.

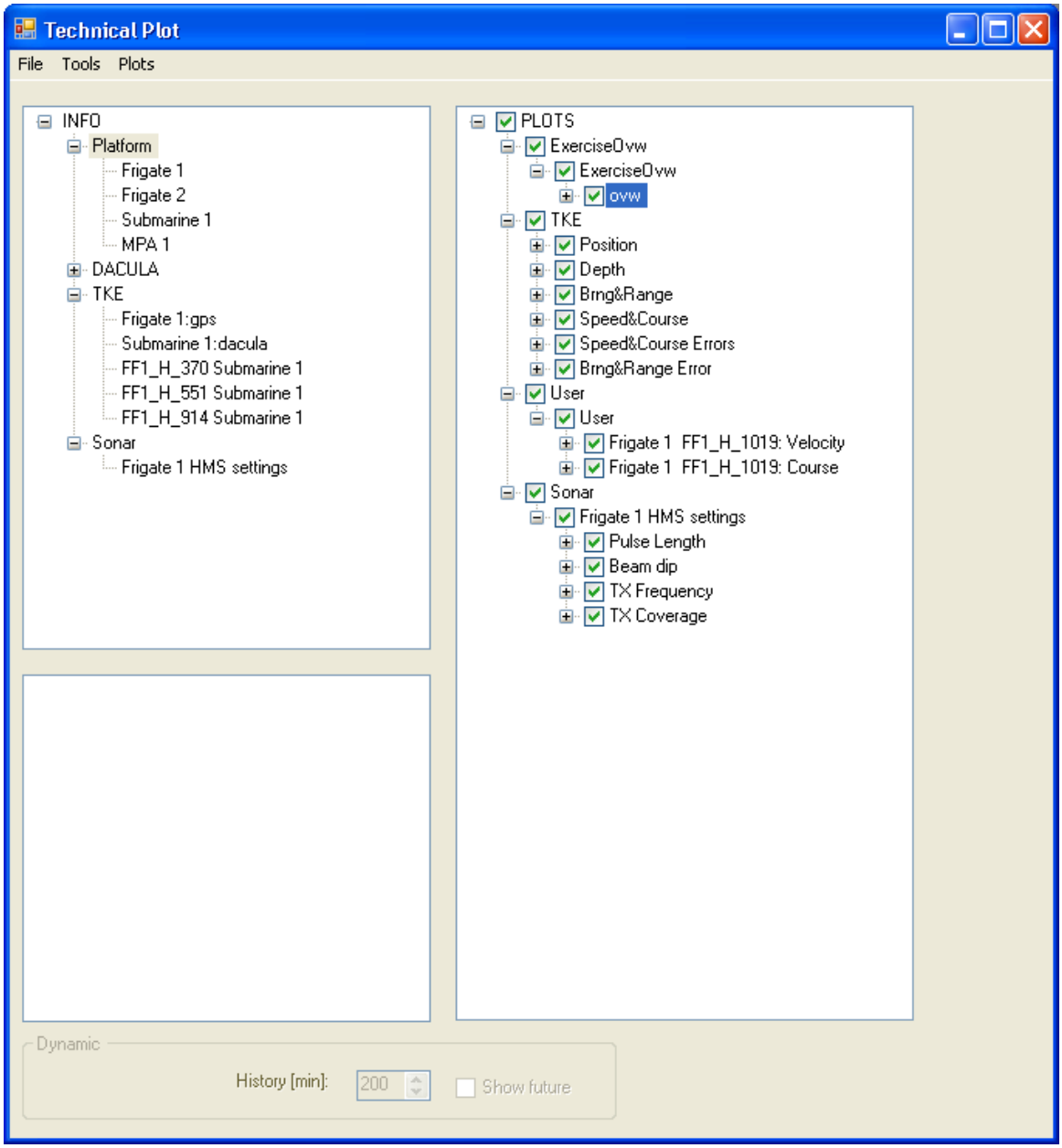


Figure 11.16 Technical Plots window with various information groups to the left and plot groups to the right.

11.6.1 Selecting information

In the upper left section of the Technical Plots window, the available information is listed. The information window will be populated based on what kind of plots that are generated.
The following information can be made available (information groups):

- Platforms, all platforms for the selected exercise(s). This information group is always available.
- TKE, kinematic examination data. This information group is available if kinematic examination plots are generated from the target table, described in section 11.3.
- Sonar TX settings data. This information is available if TX settings plots are generated from the transmission table, described in section 11.5.

We refer to the items in the information tree as information groups. When a “leaf ” group item (i.e. one that cannot be expanded further) is selected, the list box beneath the information tree is populated with data variables, see bottom left in Figure 11.16.

Both Information groups and their leaf items have associated context menus (accessed with right click). For information group *Platforms*, the option *CurveCharacteristics* can be chosen. This option allows for modification of line colour, see Figure 11.17.

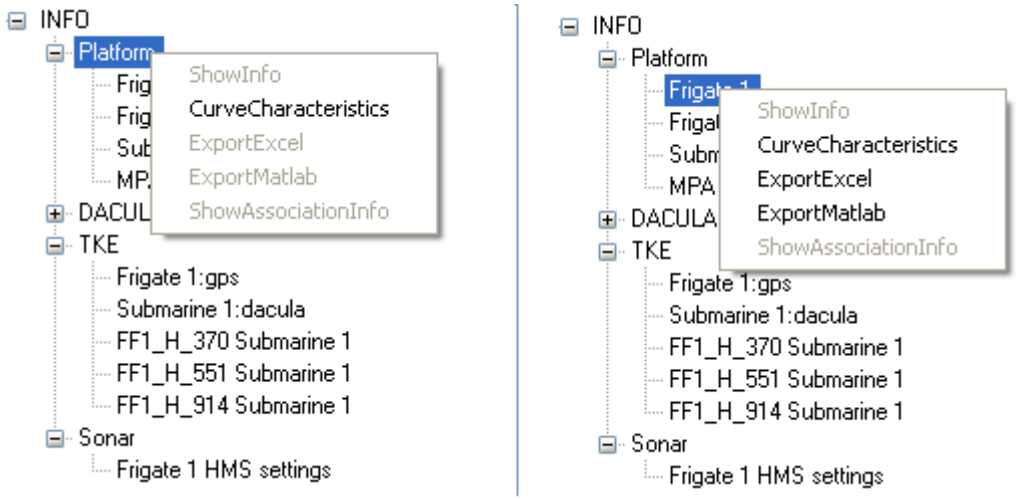


Figure 11.17 The information groups and their associated context menus

When a new plot group is generated, automatic curve characteristics will be applied. If changes are required, regenerate the plot group or use the functions *ResetCurveCharacteristics* first and then *MakePlots*. For more information on automatic curve characteristics, see Appendix A.

If *CurveCharacteristics* is chosen on Platform level (Information group *Platform* is right clicked), the platform properties can be browsed through and changes can be made. The window for *CurveCharacteristics* is displayed in Figure 11.18.

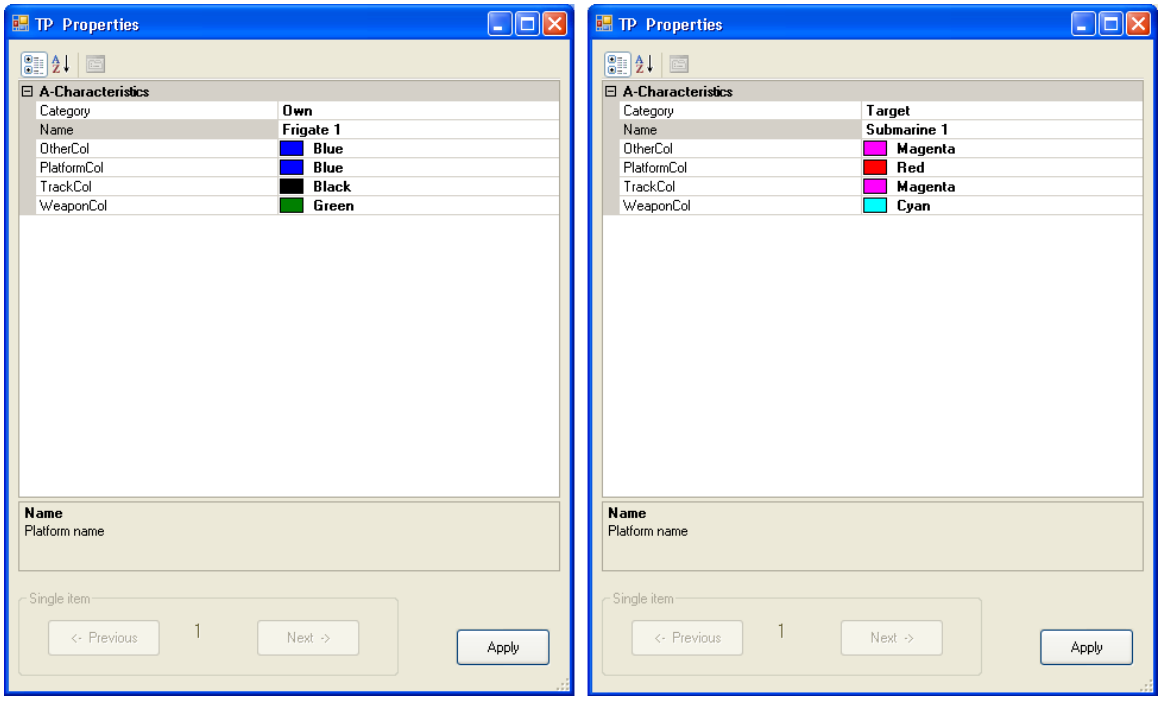


Figure 11.18 The Curve characteristics window

If *ExportExcel* is chosen on leaf level all data variables' data for the leaf will be exported to the clipboard which then can be pasted into MS Excel.
If *ExportExcel* is chosen on data variable level (data variables to the bottom left when a leaf is chosen), data for that data variable only (along with time) will be exported.
If *ExportMatlab* is chosen on leaf level, data variables associated with the group is exported to MATLAB workspace as a struct with name equal to group and members equal to data variables.
If *ExportMatlab* is chosen on data variable level, data for that data variable only will be exported.

When a leaf node is selected, a variable in the data variable list can be selected. By right clicking on a variable, a context menu is available as displayed in Figure 11.19.

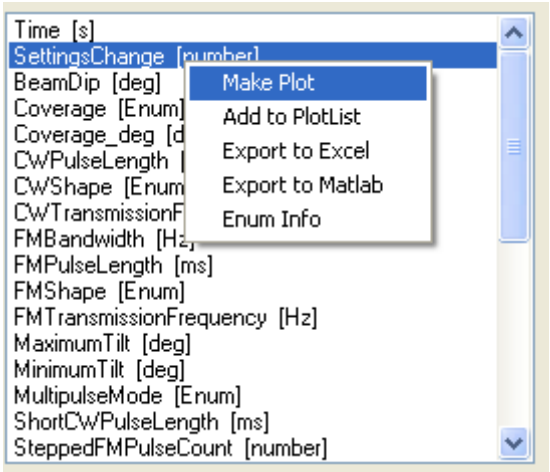


Figure 11.19 A variable in the Technical Plots window is right clicked and a context menu is displayed

Select *MakePlot* to generate a simple plot of the selected variable.

Add to PlotList will add a new curve to the selected subplot in the plot tree (to the right). Only time plots are supported by this function.
The following sequence should be followed:

1. Select a subplot, create a new if necessary (described in section 11.6.2)
2. Select variables and add them as new curves to the selected subplot.

To get Enumeration information, right click on an Enum variable in the variable list. This is the variables with "[Enum]". Select *Enum* to get an overview of valid values.

11.6.2 Manipulation of plots

Plot information can be accessed in the tree-view to the right in Technical Plot window. Plots are organized like this: Groups → Plots → SubPlots → Curves.

By right clicking on any of these tree items, various manipulation functions are available. Table 11.1 gives an overview on what tree item a function is available and Table 11.2 gives a description of the different manipulation functions.

Function	**Plot root**	**Group**	**Plot**	**Subplot**	**Curve**
Add	X	X	X		
LoadFromFile	X				
Cut		X	X	X	X
Copy		X	X	X	X
Paste	X	X	X	X	
Save		X			
MakePlots		X	X		
SetReference					X
ClearReference					X
Properties		X	X	X	X
AddUserCalc					X
ResetCurveCharacteristics		X			
ViewXML		X			

Table 11.1 Overview over for what tree item a function is available

Function	Description
Add	Adds an empty sub item, e.g. a plot beneath a group. Name is default “Added”+subitem level, e.g. AddedPlot.
LoadFromFile	Loads a (plot) group from file. Default directory can be altered by changing the working folder from the Simson menu (before starting TP), see section 13.3.
Cut	Delete and copy an item.
Copy	Copy an item.
Paste	Paste an item, e.g. a curve if a subplot is selected.
Save	Save a group of plots to file (as editable XML text).
MakePlots	Make plot(s). Only those items that have been checked are plotted.
SetReference	Sets a curve as a reference for other curves in a given subplot. Described further in appendix Appendix A.
ClearReference	Deselects any reference curve set for the subplot.
Properties	Properties for sub items. Opens a new property window.
AddUserCalc	Adds user defined curve. Described further in Appendix A.
ResetCurveCharacteristics	Reset characteristics for selected plot group.
ViewXML	Saves a plot group as an XML file named “temp” in the working folder and opens a document showing the XML representation of the plot group. Manipulation of plots with XML is described further in Appendix A.

Table 11.2 A description of the manipulation functions for technical plots

11.6.3 TP preferences

To access TP preferences, select File → Preferences in the main menu of the Technical Plot window. A new window will be displayed, see Figure 11.20.

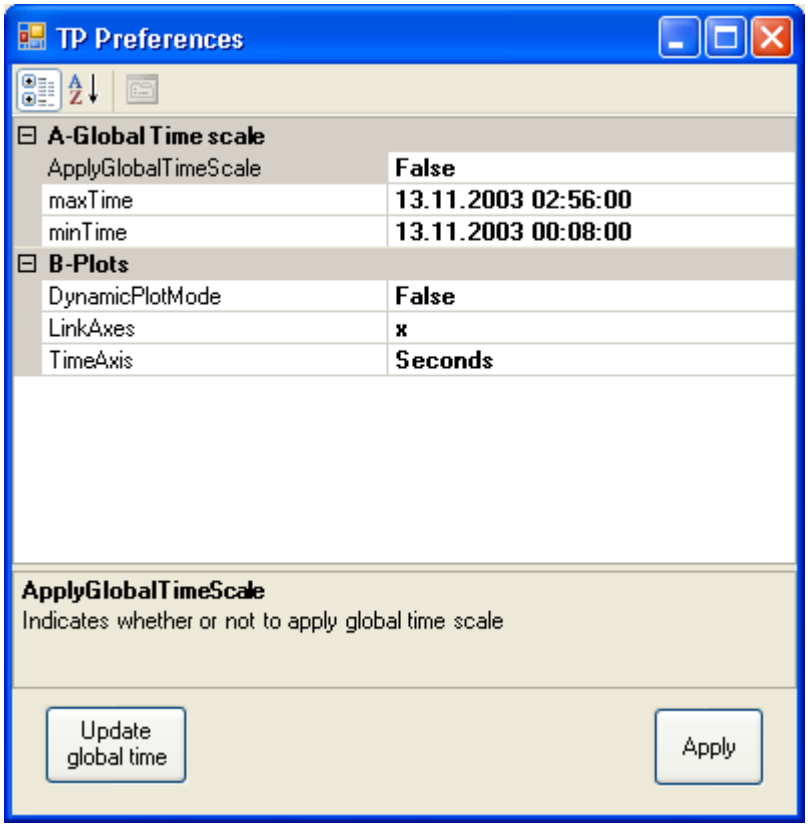


Figure 11.20 TP preferences in the Technical Plots window

Max time/ Min time

The timeframe in which the technical plots are plotted is automatically set to the extent of the available data in the plot. The scaling of a plot can be manually redefined using the *properties* context menu for a selected plot item.

To limit the time axis for all plots, set *ApplyGlobalTimeScale* to true.
By clicking the button *Update global time*, the time interval from the Global general properties (described in section 12.1) is copied.
The time interval may also be set manually.
Please note that plots must be regenerated when the time scale is altered.

DynamicPlotMode

This preference determines whether plots are updated in dynamic mode during dynamic replay. It is initially set to false, i.e. dynamic mode is disabled. The dynamic mode are described further in section 11.7.

LinkAxes

The linking of the subplots can be changed to: “x” (default), “y”, “xy” or “off”. Plots will have to be regenerated.

TimeAxis

The time axes are by default seconds. By selecting Dateticks the time axis' tick labels are changed to an absolute time reference. These tick-labels are calculated based on the start time and the seconds along the axis. Matlab will not update these labels when applying zoom, as they are manually inserted for a selection of ticks.

Use the Time Calculator described in 7 to calculate seconds from a start point in time to some given target point in time. It may also be used to calculate the time for a point, when the start time and seconds to the point is known.

11.7 Dynamic plot mode

A special presentation mode for plots is available during dynamic replay if *DynamicPlotMode* (described in section 11.6.3) has been set to true.

To enter the dynamic plot mode, start a dynamic playback (described in chapter 6). Then activate a plot, e.g. a *Speed&Course* plot. Then observe a circle on each curve indicating the current value, see Figure 11.21.

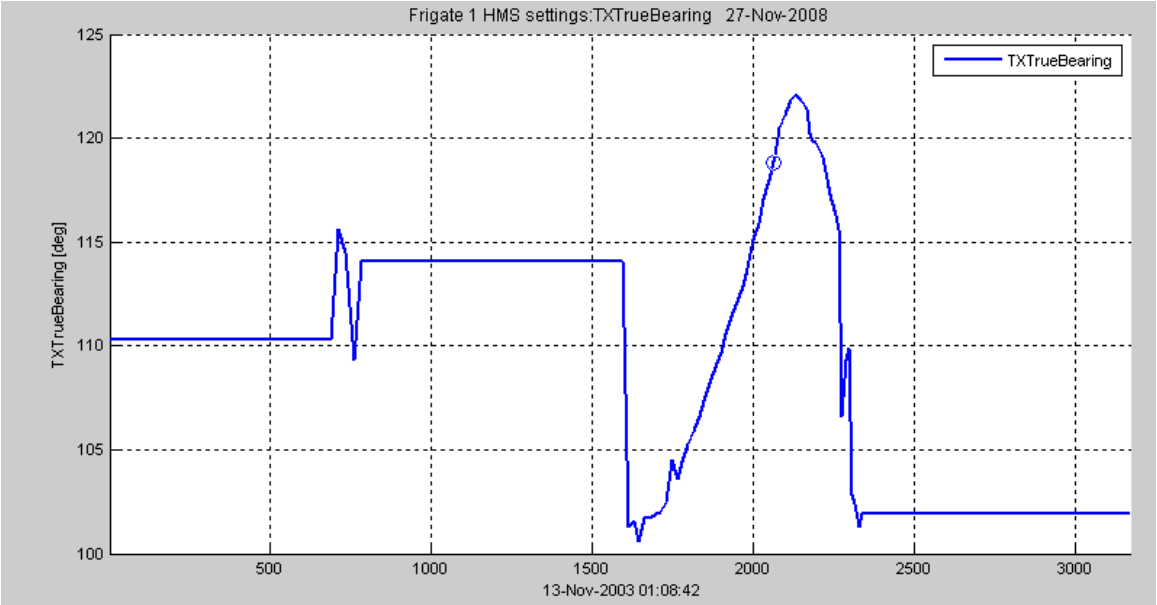


Figure 11.21 A dynamic plot with a circle indicating current value

To edit dynamic TP interaction, group values in the bottom of the technical plot window (see Figure 11.22), pause the dynamic playback and edit the values.

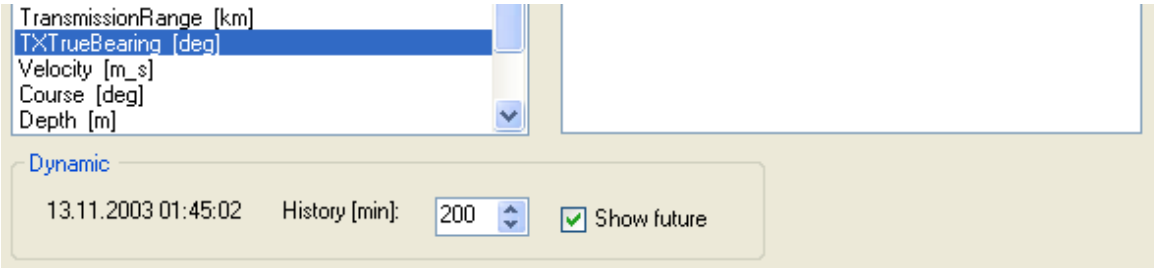


Figure 11.22 The dynamic TP properties in the Technical Plots window

History: Determines the amount of history in the dynamic TP.
Show future: If checked, a curve for a time interval equal to the *History* value will be displayed for "future" values as well (relative current playback time).

If a circle is not moving or the curve is changing, then the current dynamic time is before start time. If no circle is displayed, then the current time is after the curve stop time.

12 Simson menu: Global properties

In Simson Fennikel, the visualization properties determine how the different data are displayed in Maria. *Global Properties* allows the user to change the default values of these properties for data types in general.

The global properties are divided into the following categories:

- General
- Reference
- Track
- Transmission
- Layer

The values set for one of these data categories apply for all data of that category.
To open the Global properties, click *Simson* → *Properties*.
A window is now displayed containing tabs for the data categories, see Figure 12.1.

Figure 12.1 Global general properties

Each tab will have the buttons *OK*, *Cancel* and *Preview* displayed at the bottom:

- Click *Preview* to view how the new property settings affect the displayed data. The window will remain open and the edited properties will return to their original values when the window is closed.
- Click *OK* to apply the new settings to the displayed data.
- Click *Cancel* to close the window, any edited properties will return to their original values.

12.1 General properties

In the tab *General*, the time interval in which data is displayed can be set. This applies for data in all categories, both static and dynamic.
The *Reset time* button resets the time interval to its original value, i.e. the time span in which there exist data from the exercise. Figure 12.1 shows the tab for general properties.

12.2 Reference properties

In the tab *Reference*, properties that apply for all reference data can be set. Figure 12.2 shows the tab for reference properties and Table 12.1 describes its properties.

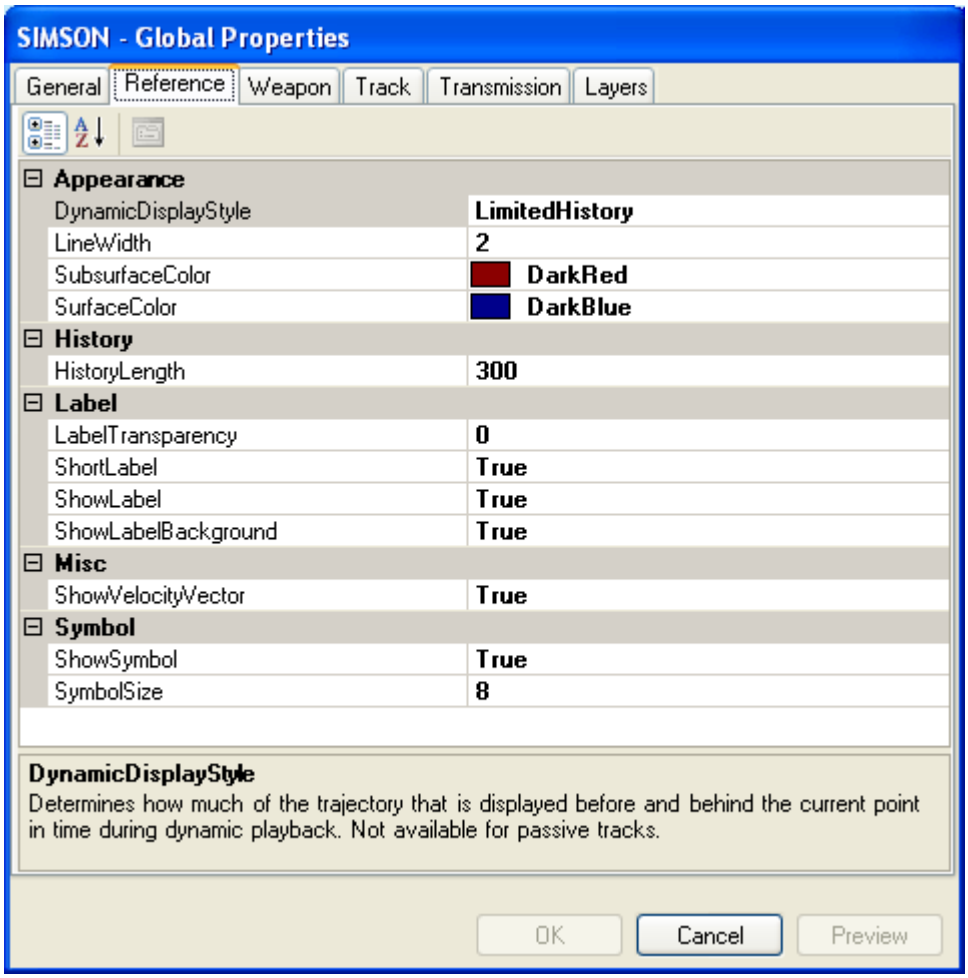


Figure 12.2 Global reference properties

Property	Description
DynamicDisplayStyle	The style in which the platform trajectory is displayed during dynamic playback. Valid values are: *History*: displayed data will not fade during playback *Limited history*: data that are no longer valid within the time frame of *HistoryLength*, will fade. *All*: the whole length of the trajectory is displayed. The *Symbol* will mark the current position in time.
LineWidth	Platform trajectory line width.
SubsurfaceColor	Subsurface platform trajectory line colour.
SurfaceColor	Surface platform trajectory line colour.
HistoryLength	Length of platform trajectory in seconds behind current position during dynamic playback. Only applicable if property DynamicDisplayStyle is LimitedHistory.
LabelTransparency	Transparency of label background in percent.
ShortLabel	Use of short or long label. The short label displays the name of the platform, and the long label display the course and velocity of the platform, in addition to the name.
ShowLabel	True if label is to be displayed, false if label is to be hided.
ShowLabelBackground	True if the label background is to be displayed, false if it is to be hided.
ShowVelocityVector	True if the velocity vector is to be displayed, false if it is to be hided.
ShowSymbol	True if symbols are to be displayed on the reference trajectory, false if it is to be hided.
SymbolSize	Symbol size. Only applicable if property ShowSymbol is true.

Table 12.1 Descriptions of Global reference properties

12.3 Track properties

In the tab *Track*, properties that apply for all track data can be set. Figure 12.3 shows the tab for track properties and Table 12.2 describes its properties.

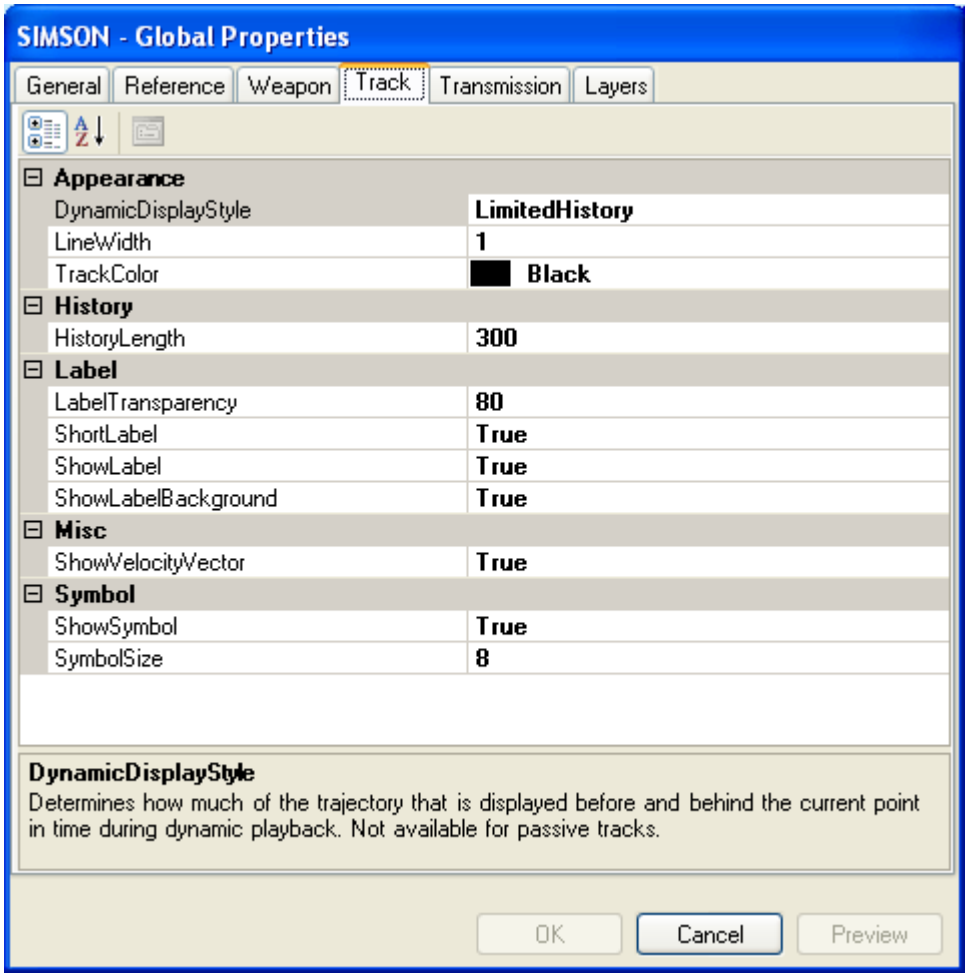


Figure 12.3 Global track properties

Property	Description
DynamicDisplayStyle	The style in which the track is displayed during dynamic playback Valid values are: *History*: displayed data will not fade during playback *Limited history*: data that are no longer valid within the time frame of *HistoryLength*, will fade. *All*: the whole length of the trajectory is displayed. The *Symbol* will mark the current position in time.
LineWidth	Track trajectory line width.
TrackColor	Track trajectory line colour.
HistoryLength	Length of track in seconds behind current position during dynamic playback. Only applicable if property DynamicDisplayStyle is LimitedHistory.
LabelTransparency	Transparency of label background in percent.
ShortLabel	Use of short or long label. The short label displays the track name, and the long label display the course and velocity of the track, in addition to the name.

ShowLabel	True if label is to be displayed, false if label is to be hided.
ShowLabelBackground	True if the label background is to be displayed, false if it is to be hided.
ShowVelocityVector	True if the velocity vector is to be displayed, false if it is to be hided.
ShowSymbol	True if symbols are to be displayed on the track, false if it is to be hided.
SymbolSize	Symbol size. Only applicable if property ShowSymbol is true.

Table 12.2 Descriptions of Global track properties

12.4 Transmission properties

In the tab Transmission, properties that apply for all transmissions can be set. Figure 12.4 shows the tab for transmission properties and Table 12.3 describes its properties.

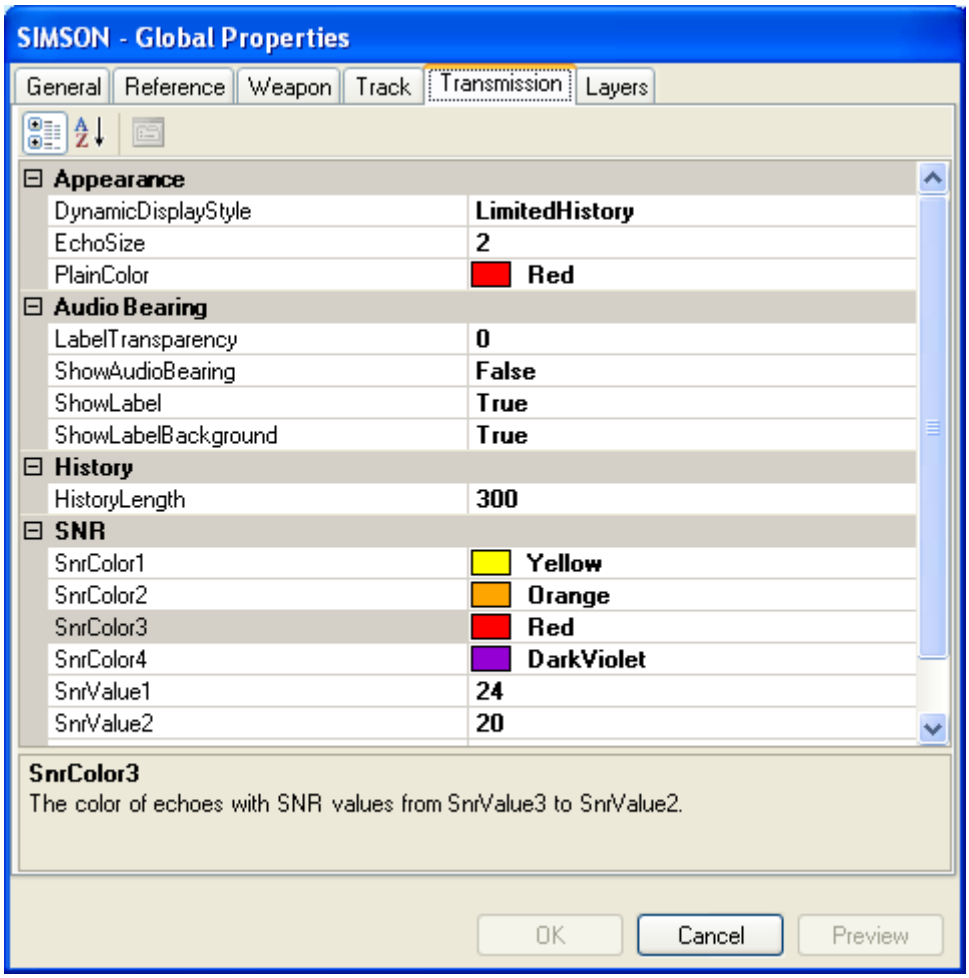


Figure 12.4 Global transmission properties

Property	Description
DynamicDisplayStyle	The style in which the echoes from each transmission are displayed during dynamic playback .Valid values are: *History*: displayed echoes will not fade during playback *Limited history*: echoes that are no longer valid within the time span of *HistoryLength*, will fade.
EchoSize	The size of the displayed echoes.
PlainColor	Echo colour when SNR colour is not used, i.e. property *UseSNR* is false.
LabelTransparency	Transparency of audio bearing label background in percent.
ShowAudioBearing	True if audio bearing is to be displayed, false if it is to be hided.
ShowLabel	True if audio bearing label is to be displayed, false if label is to be hided. Only applicable if property ShowAudioBearing is true.
ShowLabelBackground	True if the audio bearing label background is to be displayed, false if it is to be hided. Only applicable if property ShowLabel is true.
HistoryLength	Length of track in seconds behind current position during dynamic playback. Only applicable if property DynamicDisplayStyle is LimitedHistory.
SnrColor1	The colour of echoes with values more than SNR value 1, i.e. more than the value for property SnrValue1.
SnrColor2	The colour of echoes with values between SNR value 2 and SNR value 1, i.e. the span between property SnrValue1 and SnrValue2.
SnrColor3	The colour of echoes with values between SNR value 3 and SNR value 2, i.e. the span between property SnrValue2 and SnrValue3.
SnrColor4	The colour of echoes with values less than SNR value 3, i.e. less than the value for property SnrValue3.
SnrValue1	SNR value 1 in dB.
SnrValue2	SNR value 2 in dB.
SnrValue3	SNR value 3 in dB.
UseSNR	True if SNR colouring is to be used, false if plain colouring is to be used (one colour for all transmissions).

Table 12.3 Descriptions of Global transmission properties

Tips: Set SNRColour4 to Transparent to filter out weak echoes, and thus get a better visualization of echoes with high SNR values.

12.5 Layer properties

Maria uses layers to present data on the map. In the tab Layers, manipulation of these map layers can be performed. Figure 12.5 shows the tab for layer properties.

To hide a layer, uncheck the checkbox in the *Visible* column. To show it, simply check it again.

To move a layer up or down in the order in which they are drawn, click the Up arrow or the Down arrow. Please notice that the layer to be moved must be selected before each click.

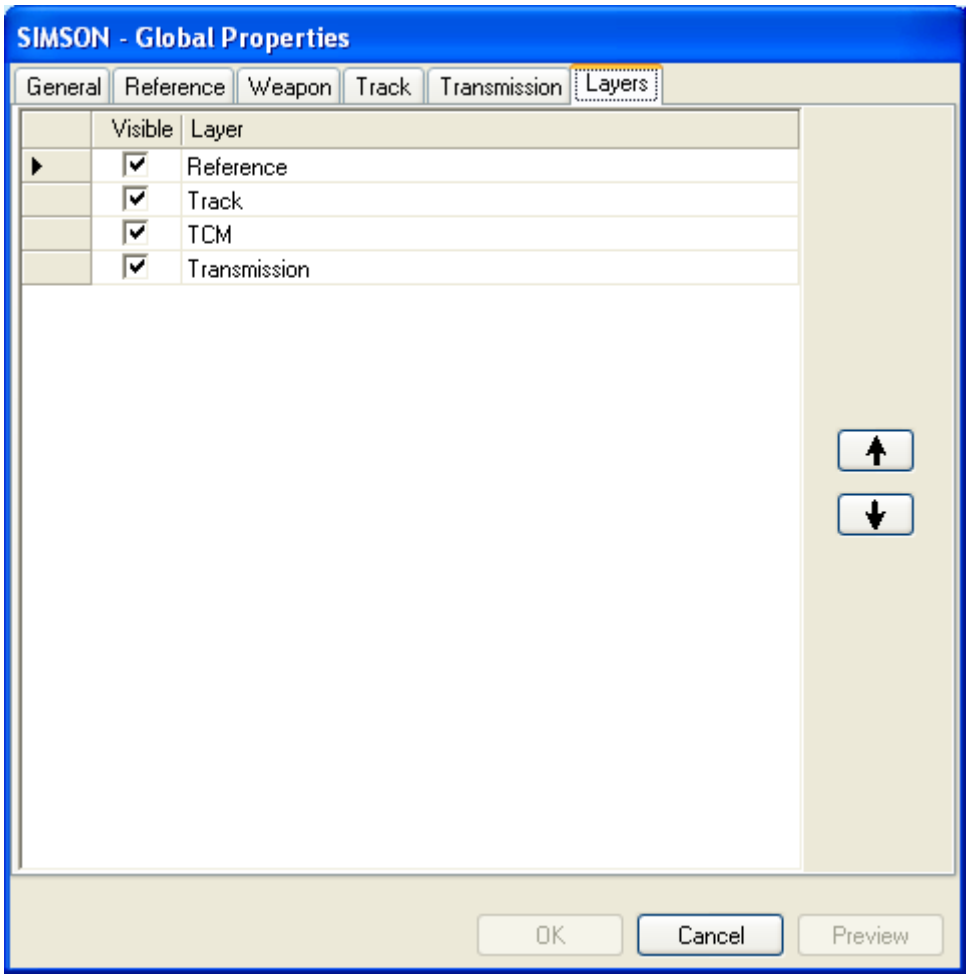


Figure 12.5 Global layer properties

13 Simson menu: Administrative functions

13.1 Clearing display of data in Maria

A quick method to clear all data from the Maria display is to uncheck the exercise in the Main Selection window.
With this method we have to check an exercise after it has been unchecked. Therefore this approach can be used when:

- One wants to remove the data and start over again.
- One wants to quickly start a new exercise.

Please ensure that all Matlab plot windows are closed before this action is performed.

Another method is to use the in-built function: *Simson* → *Clear*, see Figure 13.1.
To clear all data from the display, click *Simson* → *Clear* → *All* objects.
To clear references from the display, click *Simson* → *Clear* → *References and Weapons*.
To clear track data from the display, click *Simson* → *Clear* → *Tracks*.
To clear transmissions from the display, click *Simson* → *Clear* → *Transmissions*.

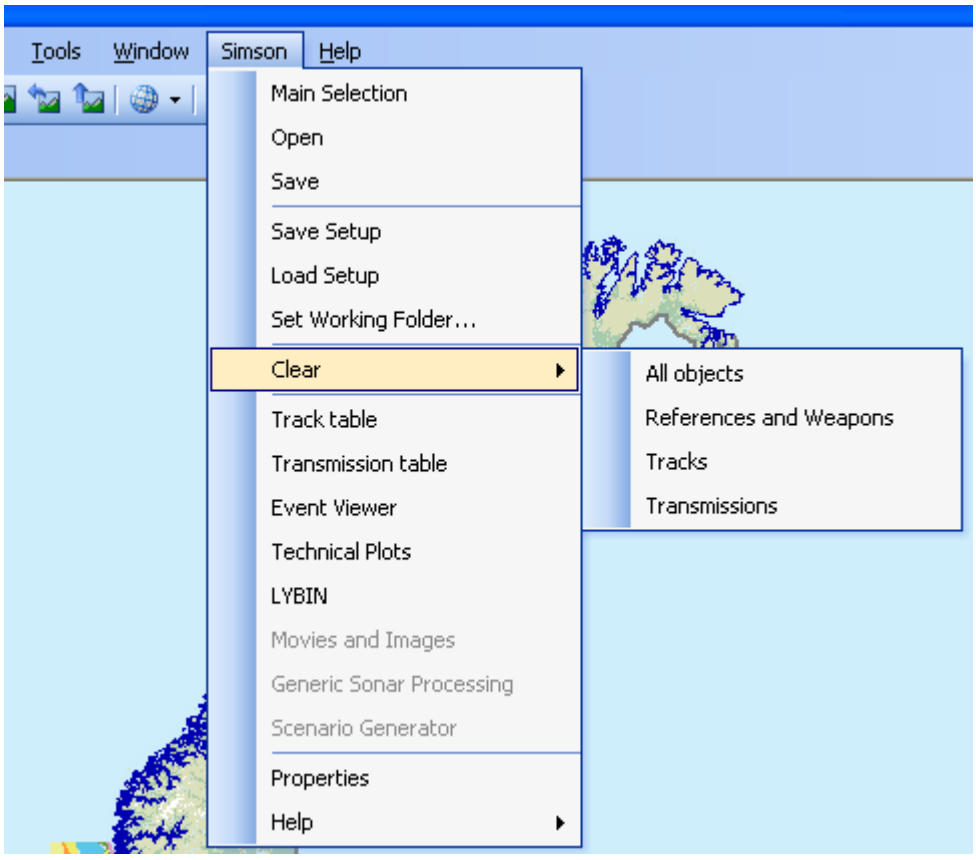


Figure 13.1 The Clear function in Simson Fennikel

13.2 Save and Load

The functionality concerning saving and loading user defined settings has not been improved from the original Simson. The settings being saved are high level settings concerning global properties or exercise selection. It is still not possible to save all user defined settings concerning individual tracks or transmissions.

13.2.1 Saving/Loading setup

The global properties and other setup parameters can be saved and loaded again later.
By *setup* we mean:

- Global properties for tracks, references and transmissions.
- Column order and visibility in the track and transmission tables.

To save the setup, select: *Simson* → *Save Setup*.
Enter a file name to save or overwrite an existing setup save file. Click *Save*.
To load a setup, select *Load Setup* from the *Simson* menu, select a file and click *Open*.

13.2.2 Saving/Loading work done during analysis

The work done during analysis can be saved and opened again later. This will save:

- Data displayed in MARIA.
- Map location
- Checked/unchecked state of the tree-structures and the filtering applied to data.
- The track table.

To save an analysis, select: *Simson* → *Save*.
Enter a file name to save or overwrite an existing setup save file. Click *Save*.
To load an analysis, select *Load* from the *Simson* menu, select a file and click *Open*.

13.3 Setting working folder

The working folder is the default save and load folder for Technical Plots. To set the working folder, select *Simson* → *Set Working Folder*.

14 Predicting sonar performance using LYBIN

14.1 Introduction

The acoustic ray trace model LYBIN [3] was originally developed by the Norwegian navy. It is used for estimation of sonar detection range and to aid understanding the acoustical conditions influencing sonar performance. FFI has through the last years done many extensions and adjustments to meet the needs of the new software for evaluation of the new frigates [10].

There are two ways to start LYBIN calculations from Simson Fennikel;

- One method is to use the window *Sarepta WS* which is located in the *View* menu. Here the user can analyze any distance on the map as long as it exist bottom data from the Sarepta service.
- Another method is to use the LYBIN alternative located in the *Simson* menu. Here the user can analyze the modelled sonar performance between the sonar and a target. By getting the dynamic time from a dynamic playback, LYBIN calculations will be performed on a vertical cross section defined by the positions of the chosen sonar and the target at the chosen time.

14.2 Sarepta WS

The Sarepta Web Service is based on the WSAMI add-in to Maria [11]. Due to further development in the bathymetric database, now called Sarepta, we have improved the add-in to become compatible with this new database.

To open the window for *Sarepta WS*, click *View* → *Sarepta WS*. A new window will then be displayed, see Figure 14.1.

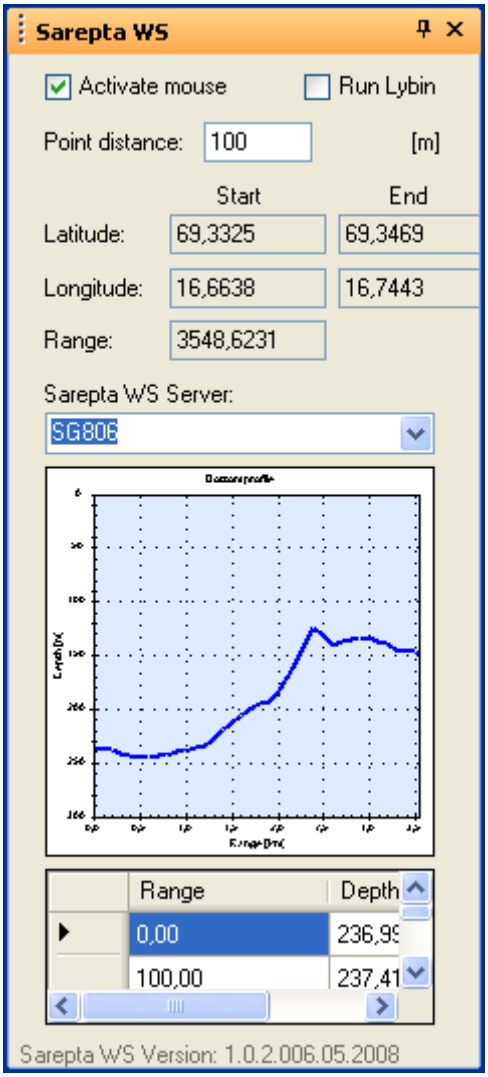


Figure 14.1 The Sarepta WS window in Simson Fennikel

Select the alternative *Activate mouse* to activate bottom profile extraction from the Sarepta service. To retrieve the bottom profile for a given distance, click on a starting point in the map, then drag to an ending point and release the mouse button. Start position, end position and distance between the positions are displayed beneath the checkboxes.

Select the alternative *Run Lybin* to activate calculations in LYBIN. To run LYBIN calculations for a given distance and bottom profile, left click and hold on a starting point in the map, then drag to an ending point and release the mouse button. LYBIN is then started automatically and a calculation is performed based on the retrieved bottom profile, and parameters set in LYBIN for previous runs. See [3] for guidance on parameter setting and plot generation in LYBIN.

The textbox *Point Distance* beneath the checkboxes contains the distance between measuring points in the bottom profile. The bottom profile's resolution can be manipulated by increasing or decreasing this value.

To set the server name for which the Sarepta service is running, insert the name of the service server in the combo box beneath *Sarepta WS Server*. If the service is running on the same computer, the computer name or simply “localhost” should be inserted.

14.3 Lybin presettings

To open the window for *Lybin presettings*, click *Simson* → *LYBIN*. A new window will then be displayed, see Figure 14.2.

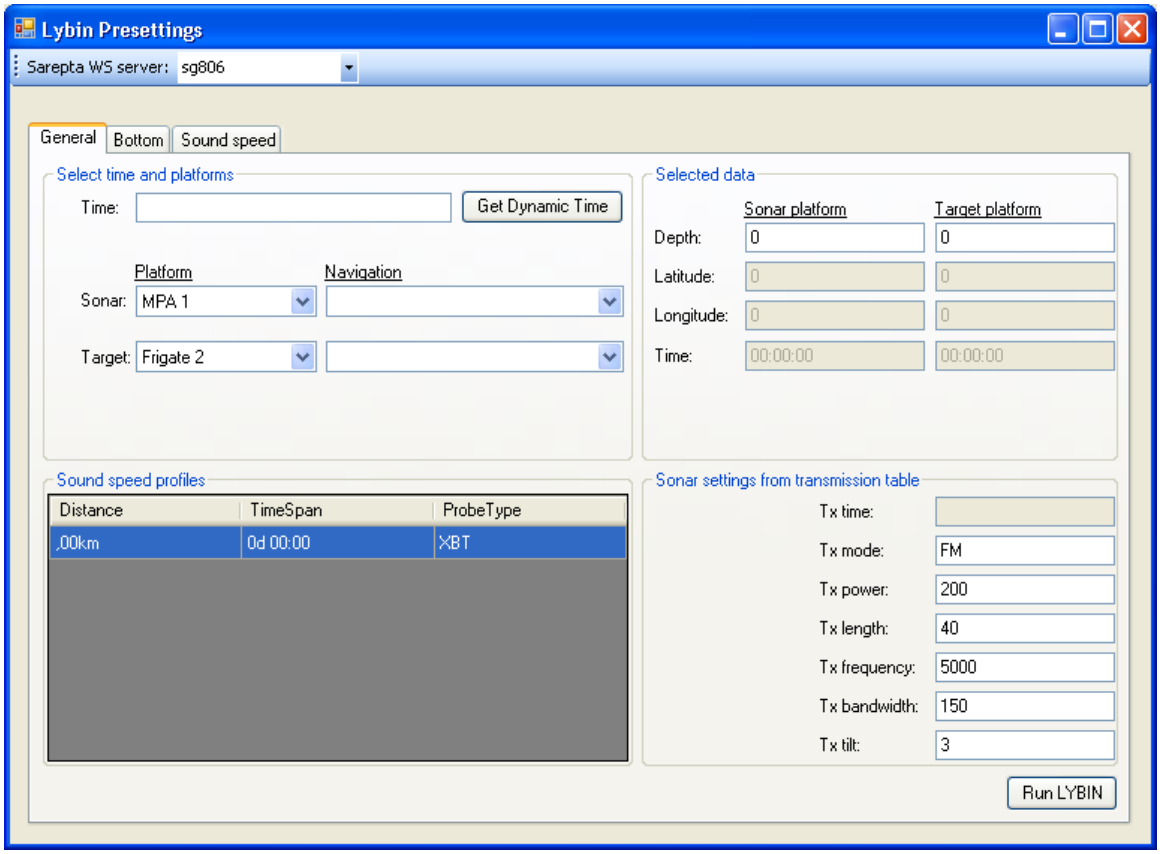


Figure 14.2 The Lybin Presettings window in Simson Fennikel

This option is used to analyze the modelled sonar performance between the sonar and a target. Data are loaded into the window when dynamic playback (described in chapter 6) is run to a desired point in time (see Figure 14.3), or a valid time is inserted manually; therefore the *Lybin presettings* window will not contain any data before this step is executed.

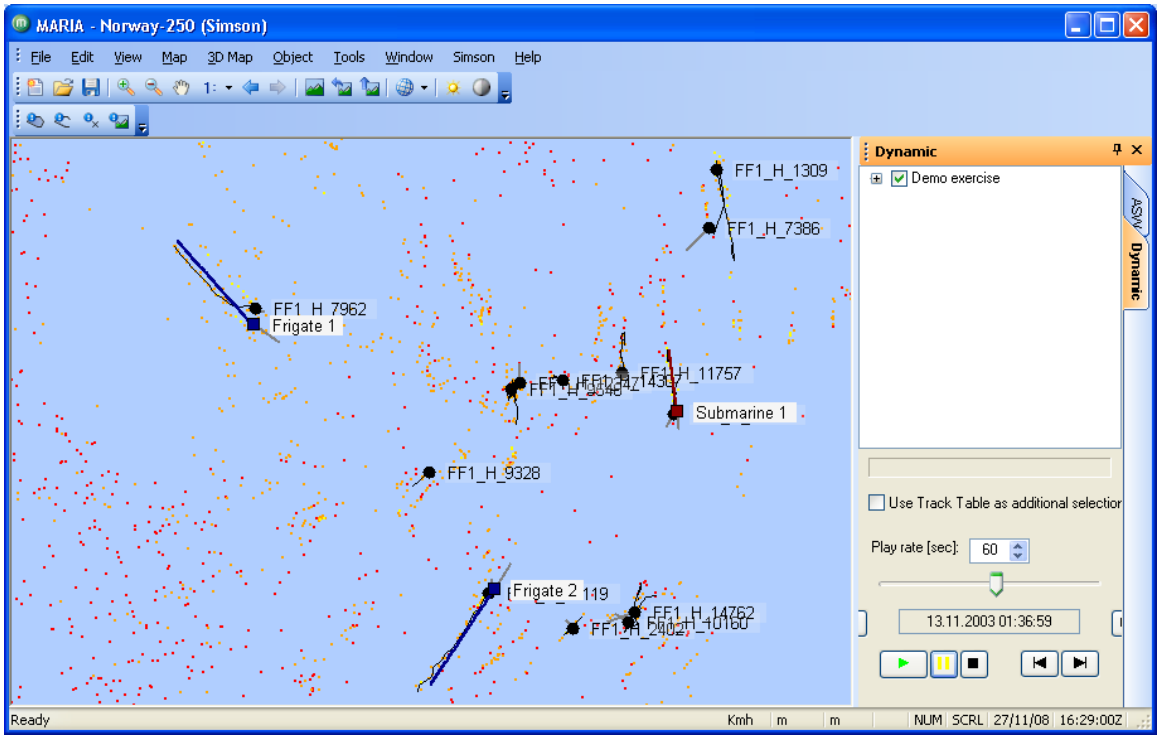


Figure 14.3 The dynamic playback window with a paused scenario

In the top left corner the Sarepta server's name must be placed. If the server is on the same machine as the application, "localhost" must be inserted.
To load data for a given point in time into the window, click the button "Get dynamic time".

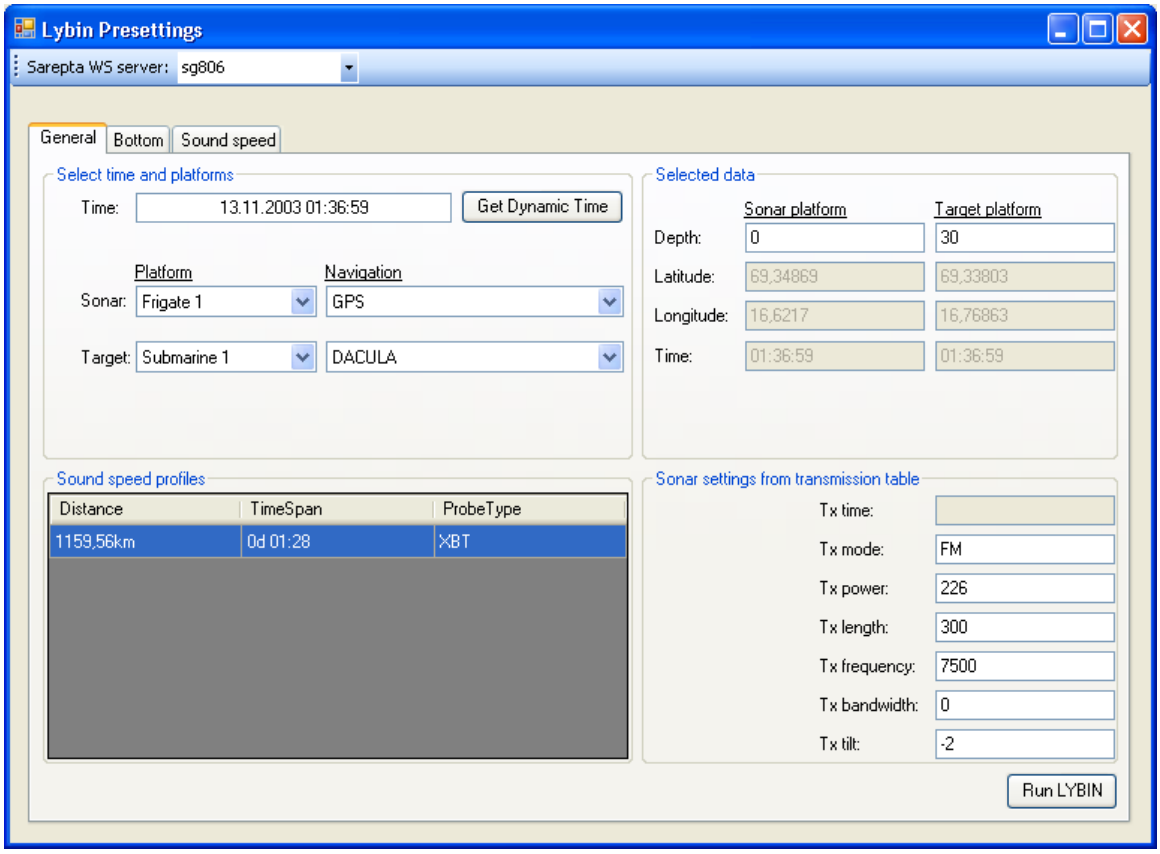


Figure 14.4 The Lybin presettings window with data loaded

The window for *Lybin presettings* are divided into three tab pages: *General*, *Bottom* and *Sound Speed*.

The first tab (Figure 14.4), *General*, is now loaded with data. The page is divided into four sections;

- Select time and platforms.
- Sound speed profiles containing sound speed profiles from the database.
- Selected data containing depths and positions.
- Sonar settings from transmission table.

The information boxes for Sonar and Target are loaded with two platforms. Adjust them to correct platforms and correct reference point origin.

Select a sound speed profile by right clicking and selecting *Add* in the resulting context menu, see Figure 14.5. Every sound speed profile that is “added” here will be added to the list of profiles in the *Sound Speed*-tab.

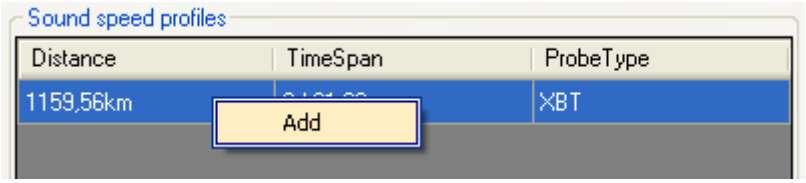


Figure 14.5 Selecting a sound speed profile in the Lybin presettings window

The columns *Distance* and *TimeSpan* will help finding the correct profile from the database. A positive time span indicates a measurement performed back in time compared to the dynamic time, a negative time span indicates a measurement performed later in time.

To set the depths for sonar and the target, adjust the depths in the section for *Selected data*.

Sonar settings from selected point in time are retrieved from the selected data set in the *Transmission Table* window, see chapter 9. If no *Sonar detection* data are selected, a warning is displayed in the *Lybin presettings* window, and sonar settings can be set to the desired values for calculation.

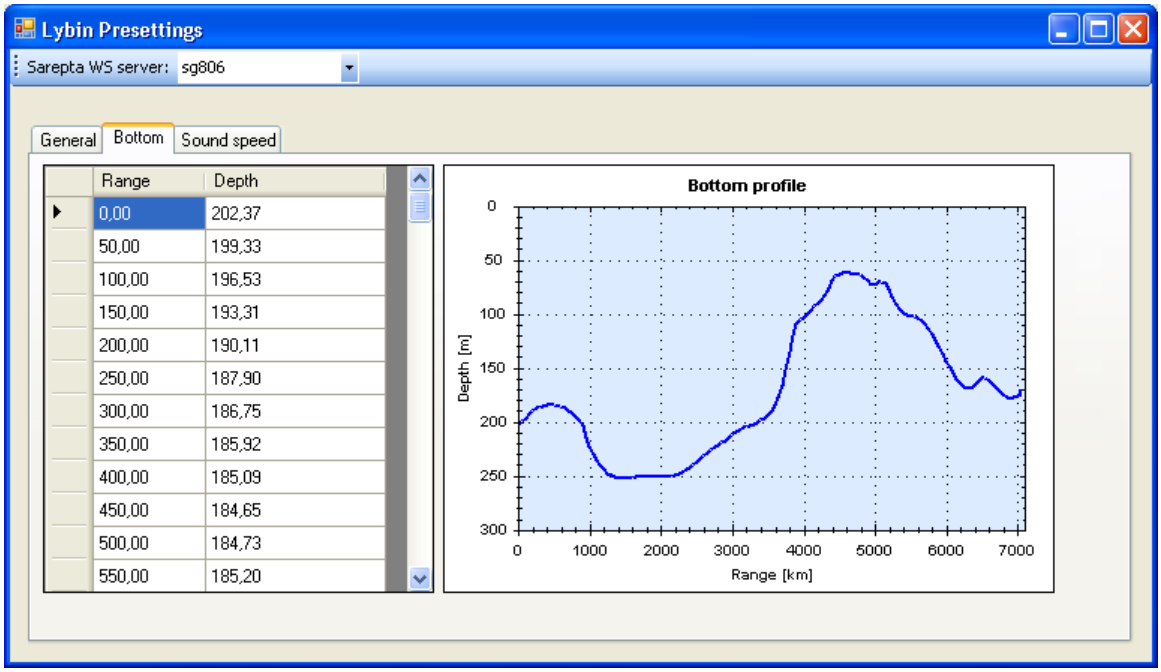


Figure 14.6 The second tabular page, Bottom, in Lybin Presettings

The *Bottom*-tab (Figure 14.6), is now loaded with a bottom profile from the Sarepta service. To zoom in on an interesting values, left click and hold, then drag to create a rectangle surrounding the area that is interesting.

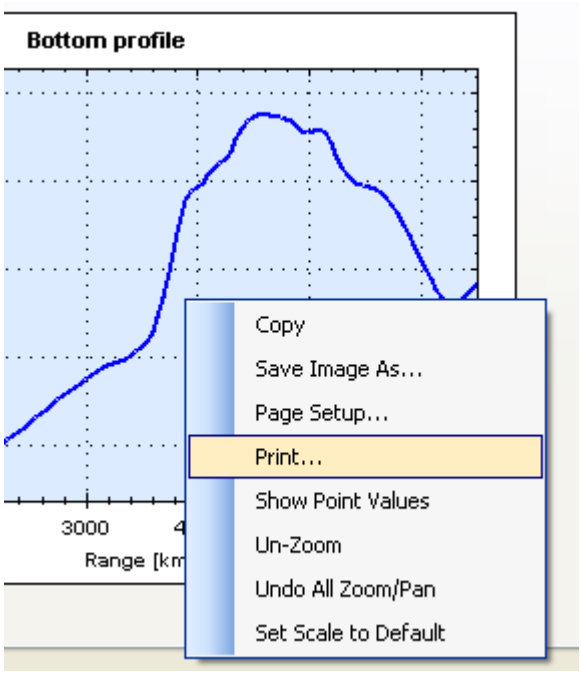


Figure 14.7 The context menu in the Lybin presettings window's second page, Bottom.

By right clicking inside the plot view, various functions are displayed in a context menu (Figure 14.7):

- *Copy* – copies the plot to the clipboard.
- *Save Image As* – allows for saving of the plot.
- *Page Setup and Print* – allows for printing.
- Un-zoom, Undo zoom and set scale to default – allows for control of the zooming.

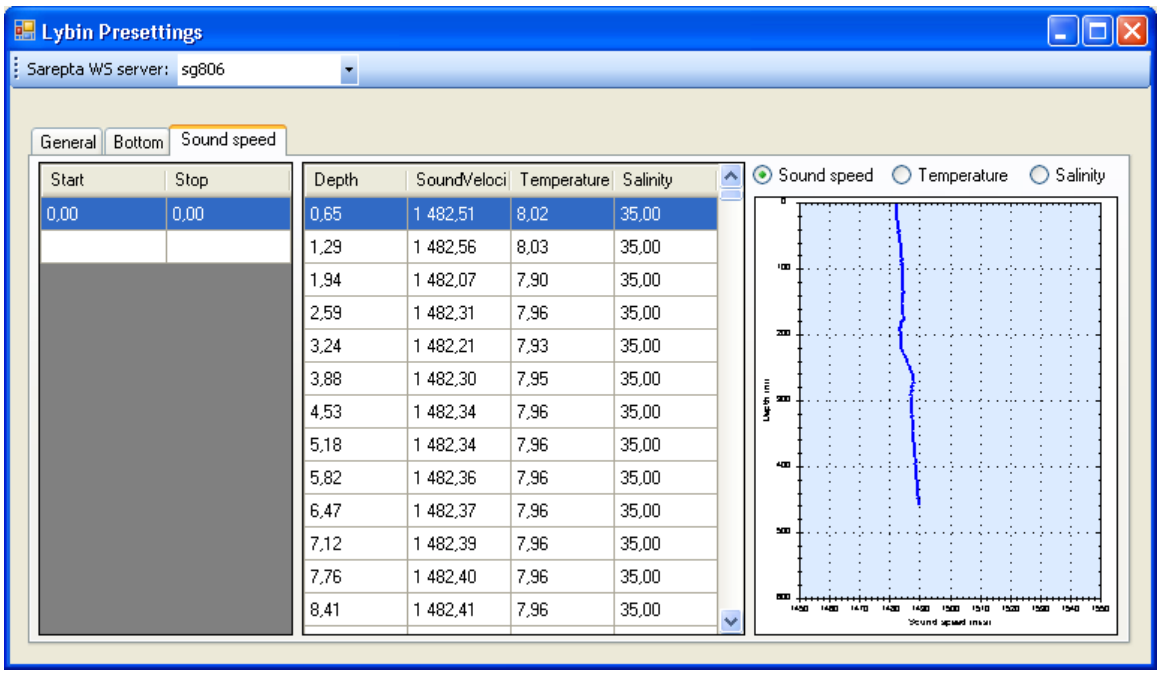


Figure 14.8 The third tabular page, Sound Speed, in Lybin Presettings

The *Sound Speed*-tab (Figure 14.8), is loaded with sound speed profiles which are added from the *General*-tab.

The left part of the *Sound Speed*-tab contains a list of imported sound speed profiles. If several profiles are added, they are added at the bottom of this list. In the middle the actual sound speed profile is displayed in tabular form (the one that is selected to the left).
Sound speed, temperature or salinity is plotted to the right. Click the radio buttons to view the plots. Like described in the plot for bottom profile, plot control functions can be accessed by clicking inside the plot, see Figure 14.9.

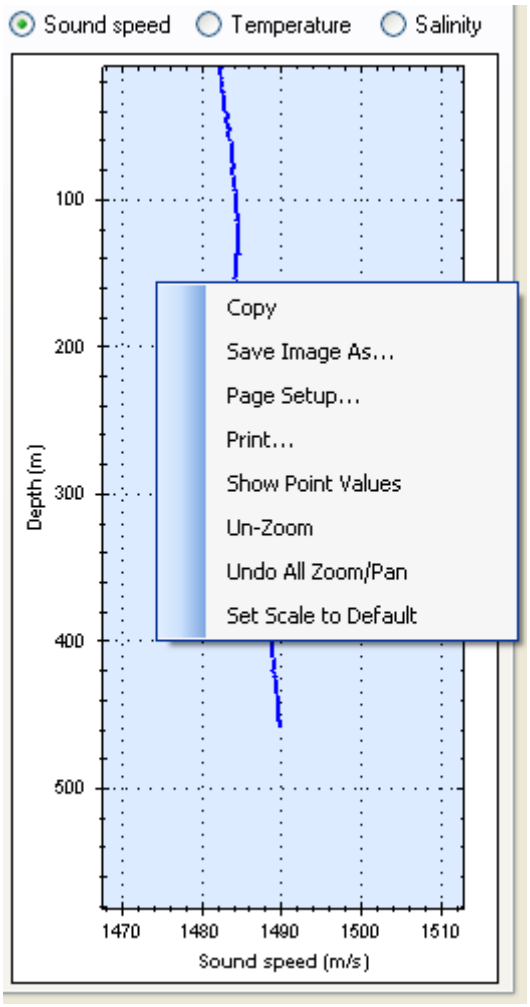


Figure 14.9 The context menu accessed from the sound speed profile plot

By right clicking on a profile in the profile list to the left a context menu is displayed, see Figure 14.10.
To smooth the profile, click *Smoothen* and choose one of the alternatives.
To recalculate the sound speeds using a different salinity, choose *Recalculate* and insert a new salinity.
To remove a profile, choose *Remove*. The selected profile will then be removed from the view.

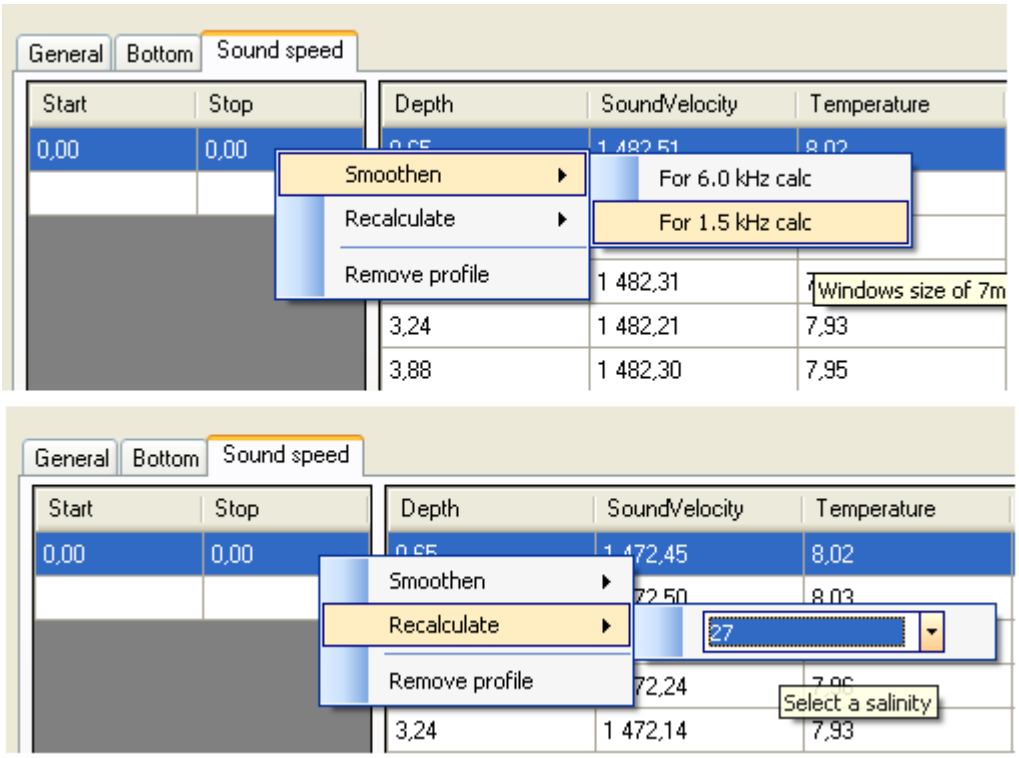


Figure 14.10 The displayed context menu when sound speed profiles are right clicked in Lybin Presettings

It may be wise to remove old/unused profiles from the sound speed profile views to have control on which profile that is actually being used in the LYBIN calculation.

To run a LYBIN calculation with these presettings, click the button *Run LYBIN*. LYBIN is then started automatically and a calculation is performed based on the preset parameters. Other parameters, than bottom profile, sound speed profile and some of the sonar parameters, are those set in LYBIN in previous calculations.

15 Conclusion

Project 899 “Nansen-klasse fregatt, evaluering” is to supply the navy with quick-look analysis software, for anti-submarine warfare (ASW), by the end of 2008. The software is intended used on board the Norwegian Fridtjof Nansen class frigates. The analysis software, named Simson Fennikel, will aid in the evaluation of the actions during ASW exercises. The Simson Fennikel Collector application [5] will be used to handle recorded data, and store the relevant data in a Simson database. The data in the database is in turn accessed by Simson Fennikel.

Simson Fennikel is a version of the Simson ASW analysis software [6] with quick-look relevant functionalities. This includes visualization of positioning and dynamics of the platforms involved, the settings and performance of the acoustic sensors, and the events noted automatically or manually during the exercises. Data are presented in a geotactical display window, graphs or tables using one or two screens. Simson Fennikel is a valuable asset in debriefing the crew, increases the lessons learned and thus the benefit of an ASW exercise.

Both Simson Fennikel and FC is installed on board the Norwegian Fridtjof Nansen class frigates and used by naval officers. This user manual is intended to help these users to use Simson Fennikel to do quick look analysis after ASW exercises.

The software is based on Microsoft technology and run under Windows. Mandatory components are a database (MS SQL) for data storage and an application, Maria[1], to visualize data. To be able to utilize functionality for technical plots, Matlab[2] must be available. To be able to utilize functionality for simulation of sonar performance, Lybin[3] must be available.

Our goal is that navy personnel are to be able to do quick-look analysis of ASW exercises. To achieve this, FFI personnel will continue to maintain the software, participate on frigate campaigns and contribute in the effort to put Simson Fennikel training as a part of the navy’s education.

Over the next years, FFI will develop new software to aid tactical analysis on higher level, involving multiple naval units. Functionality from Simson Fennikel will be found in these tools. In addition, functionality and data will be adapted to higher level of tactical analysis.

Experience from exercises shows that the crew on the frigate needs practice within anti-submarine warfare and Simson Fennikel is a tool to aid in this activity. This document is a user manual and it describes all functionality of the software.

References

[1] "www.teleplanglobe.com," 2008.

[2] "www.mathworks.com," 2008.

[3] S. Mjølsnes, "LYBIN SGP-180(C) - Model Description," The Royal Norwegian Navy Materiel Command, Bergen,2000.

[4] J. Wegge and E. Tveit, "OVERALL DESCRIPTION OF AN ANALYSIS AND SIMULATION TOOL FOR ACOUSTIC ASW SENSORS," FFI rapport 2003/01928, 2003.

[5] A. L. Gjersøe, M. Bosseng, and F. Hermansen, "Simson Fennikel Collector 1.2 – User Manual," FFI rapport 2008/01566, 2008.

[6] T. Dørum, E. Nordø, F. Hermansen, A. L. Gjersøe, and K. T. Hjelmervik, "SIMSON Analysis Tool - User Guide," FFI rapport 2005/02708, 2005.

[7] M. Bosseng and A. L. Gjersøe, "Simson Fennikel Installation DVD,"08/02185-1, 2008.

[8] K. Landmark, "Levering av konfidensielle dybdedata," DVD 2008/01572-1 (CONFIDENTIAL), 2008.

[9] A. L. Gjersøe, "Simson Fennikel Collector Installation CD,"2008/01923, 2008.

[10] E. Dombestein and S. Alsterberg, "LYBIN XML grensesnitt versjon 1," FFI Rapport 2006/00266, 2006.

[11] F. Hermansen, "Accessing environmental data using the Simson tool," FFI-Notat 2006/00777, 2006.

Abbreviations

ASW	Anti Submarine Warfare
ATAS	Active Towed Array System
CPU	Central Processing Unit
dB	decibel (µPa/sqrt(Hz))
FC	Simson Fennikel Collector
FFI	Norwegian Defence Research Establishment
HDD	Hard Disk Drive
HMS	Hull Mounted Sonar
IIS	Internet Information Services
LAN	Local Area Network
Maria	Map Application from Teleplan AS
MSIFC	Multi Sensor Integration Fire Control
RAM	Random Accessed Memory
SNR	Signal to Noise Ratio
TKE	Target Kinematic Examination
TP	Technical Plots
WOE	Weight of evidence

Appendix A Technical Plots – Advanced use

This appendix is created to separate functionality in Matlab that are used more seldom from the main part of the manual for Technical Plots. It is based on functionality descriptions given in [6].

A.1 Matlab figures layout

The figure layout can be changed by using the icons in the upper left part of the figure window as displayed in Figure A.1 where the “tile” function has been selected.

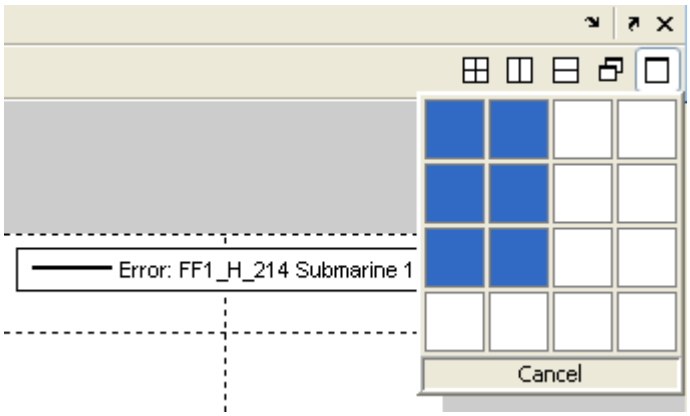


Figure A.1 Changing presentation of figures

The result from applying the change in presentation is displayed in Figure A.2.

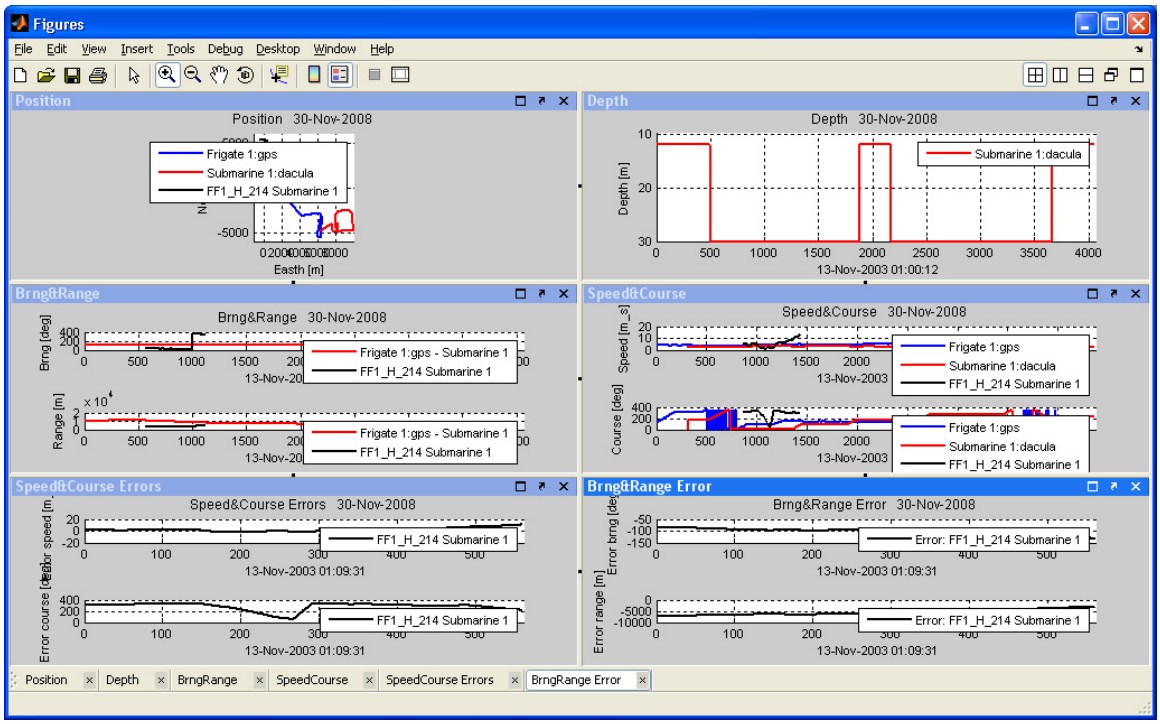


Figure A.2 TKE plots presented in three rows and two columns

Note that the curved arrow (left of X) can be used to dock/undock the figures window (containing all the figures) from the Matlab window or to dock/undock a single figure from the figures container window.

Observe that there is much functionality available in the MATLAB figures, a few examples are:

- change of colour, line style, line width and legend of a curve
- draw own lines and text
- export to file or printing of the figure
- copy figure to clipboard enabling direct pasting of it into MS office applications
- save to MATLAB format (.fig) and later reopen the figure for *additional* editing. (Reopen from any MATLAB figure in Simson Fennikel or direct from MATLAB itself used as a stand alone tool).

Interactive editing of the figure can be initiated from the main menu in Matlab or from the plot tool icon in the Figures window as displayed in Figure A.3. Please consult the help menu in the figures container window for changing figure properties.

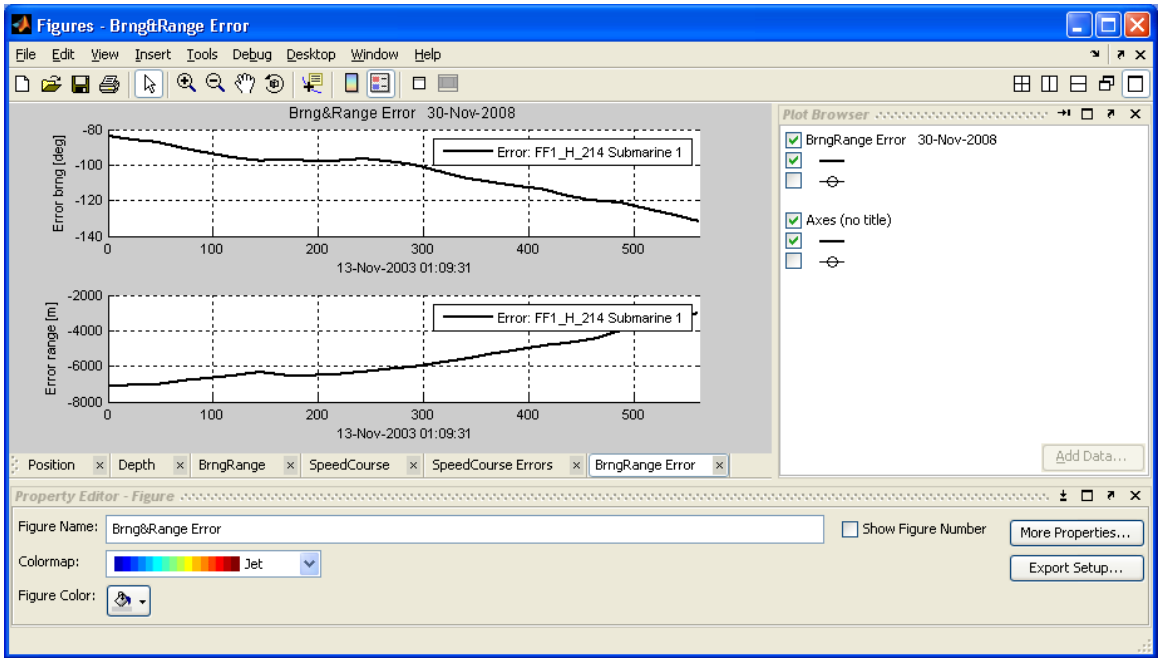


Figure A.3 Interactive editing of Matlab figures

A.2 Curve Characteristics

We will first briefly describe **automatic** curve characteristics (line colour, line width, line type and symbol). The user can affect the use of line colour (explained later on). Also note that automatic curve characteristics always can be overridden by setting the property *AnnotationMode* to manual mode for a specific curve. Right click on the curve name in TP and select Properties to access the property.

The automatic curve characteristics work as follows:

The information in a curve is classified as one of 4 information categories:

a) platform trajectory data
b) track data
c) weapon trajectory data
d) other types of data

Automatic curve characteristics are determined as a function of:

a) the owner (i.e. platform) of the information
b) the information category

For each platform each information category has unique predefined characteristics.
Three default sets of curve characteristics for the four types of information categories are available:

- *own*
- *target*
- *other*

The default target is initially given the category *target*. All other platforms are given the category *own*.

Whenever a curve to be plotted in a subplot has identical colour to a previous curve, the line style is changed in a cycle (between solid, dotted, dash-dot and dashed). So if 5 curves have identical colour, it will not be possible to see the difference between curve 1 and 5. The user can change category or redefine the colour for each of the 4 information categories (in this case the curve characteristics category is defined as type *user).*

The automatic colouring scheme above will result in the same colours as initially selected for the geotactical display with regard to platform trajectories and surface tracks and weapon trajectories. Changes in colours for the geotactical picture will not change the TP automatic curve characteristics.

When a new plot group is generated, automatic curve characteristics will be applied. Changes later on will not affect the plot group. If changes are required, you have to *regenerate* the plot group (using various automatic or interactive modes) or use the functions *ResetCurveCharacteristics* and *MakePlots*.

Tip: Select *platform* in the information tree and *CurveCharacteristics*. Browse through platform properties and make changes, see Figure A.4.

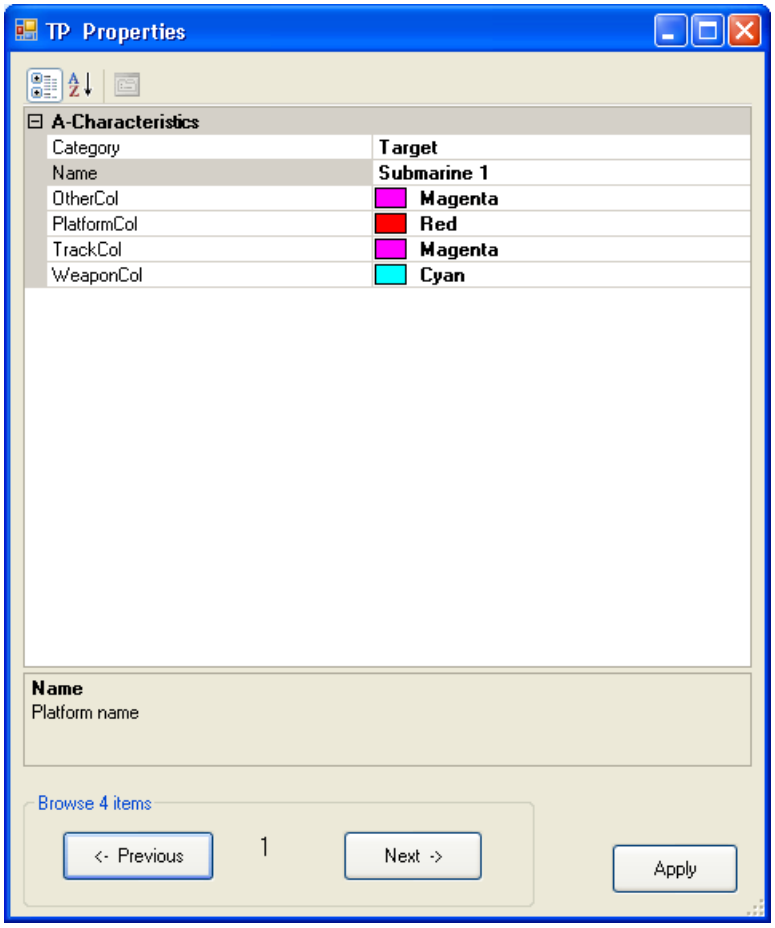


Figure A.4 Curve characteristics window

A.3 Manipulation of plots

A.3.1 Function SetReference

This function is used for selecting a curve as a reference for the other curves in a given subplot. I .e. the difference between a curve and the reference curve is calculated and displayed.
The curve selected as reference is not displayed (check box on/off has no effect) since this curve has constant values equal to 0. The only way to see if a reference curve has been defined in the plot tree is to select the subplot and inspect its properties. The property *RefCurve* will point to the reference curve (if defined). The *SetReference* function is only available for time-variable plots (not x-y plots).

A.3.2 Function AddUserCalc

This function is used to add a user defined curve (both time plot (Y-T) and position plot (YX-T). MATLAB syntax is used to define the curve.

The procedure to add such a curve is the following:

1. Select a (standard) curve you want to use as a basis and the function *AddUserCalc*. A new curve named “UserCalculation” is added to the subplot.

2. Select the new curve and the function *Properties*, see Figure A.5.
   Locate the property *user code* (see Figure A.6) and input (valid) MATLAB code.
   The code must define a struct named with the curve id (e g ‘c2’)
   and with members t and y (for Y-T plot) and t, y and x for (YX-T plot).
   You may also rename the curve and change other properties.

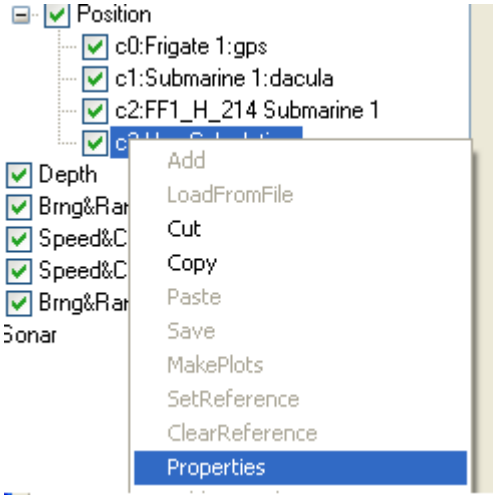


Figure A.5 Selecting Properties for user curve

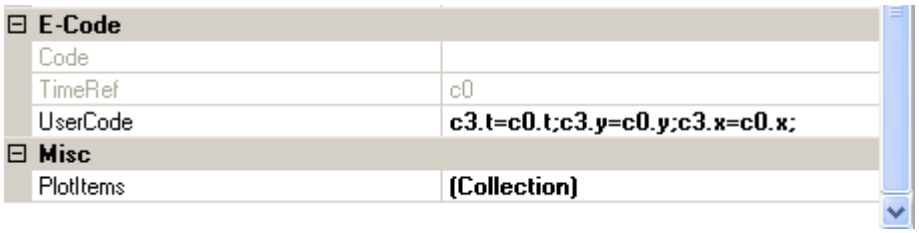


Figure A.6 The property UserCode for a user curve

Assume that curve 0 was selected as basis and that the new curve has number 3. Then initially a Y-T plot would contain: *c3.t=c0.t; c3.y=c0.y;* and an YX-T plot: *c3.t=c0.t; c3.y=c0.y; c3.x =c0.x;* (Y is north and X is east).

c3.t is seconds relative a datetime reference which is the same as for the base curve (c0).
The base curve id is shown as *TimeRef* in the property window for the user defined curve.

Any valid Matlab code will work. E.g. you may execute functions, scripts or import data from files etc. Invalid Matlab code will trigger an error message and no curve will consequently be generated.

The TKE bearing and range error subplots contain curves of this type (defined programmatically). Assuming a single track has been selected, the error curve is number 2. Inspect the properties of this curve (If errors for a single track is required, the set reference scheme above is much simpler.

However, errors for multiple tracks against different references require another approach).
Tip: use of the MATLAB interpolation function interp1 is very useful.

Example 1: Calculating a mean error curve.
Make TKE plots as described in example in section 11.3. Let us make a curve showing mean range error. Cut the bearing error plot. Select the range error plot, then select curve c0 and AddUserCalc. Change the user code to the following:
c3.t=c0.t; c3.y=mean(c2.y)*ones(size(c0.t));

Example 2: Showing a bearing in the TKE position plot.
Assume the same as the previous example. By inspecting the TKE plots we find that max range error is at time 5658 (relative Bergen: GPS). Select the Position (subplot), curve c0 and *AddUserCalc*. Select curve c3 and input the following code:
c3=UCBrng(c0,5658,c2);
UCBrng is a SIMSON function which determine coordinates for a bearing from *c0* at time = 5658 (relative c0 datetime) to *c2* (at same datetime).

More bearings can be added by copying c3 and pasting it. Only change time and id of return value for new curve.

A.3.3 Manipulation of plots via XML representation

A plot group can be saved as an XML document and the user might load it later on in order to regenerate a set of plots. The XML representation is created automatically by using .NET serialization method (and thus also support the deserialize method during loading of a plot group). Thus the amount of code required is almost nothing. However, the generated XML is fairly extensive and not very user-friendly. Still, expert users might want to modify or specify new plots using this representation (typically by writing special application programs that generates the XML code).

To save an XML representation of the plots, save the TKE plot group and open the document in Windows explorer with an editor. Change parameters and save the document. Load it into TP again by right clicking on the plot root (“PLOT”) and selecting *Load from File*. Then after regeneration of plots, the changes should be visible.

Although the XML file generated during save is quite extensive, very little information is required since most values have reasonable default values. An example of a minimum file is displayed in Figure A.7.

```
<?xml version="1.0" encoding="utf-8"?>
<PlotGroup xmlns:xsd="http://www.w3.org/2001/XMLSchema"
           xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance
 Label="TKE" >
  <Contents>
   <Plot Label="Speed">
    <Contents>
     <SubPlot Label="Speed" >
      <Contents>
       <Curve Label="Bergen:gps"  CID="c0" >
        <Contents />
        <Data ID="SIMSON:15:1" T_Y_X="Time Velocity" />
       </Curve>
      </Contents>
     </SubPlot>
    </Contents>
   </Plot>
  </Contents>
</PlotGroup>
```

Figure A.7 Example of the minimum XML file to load into TP

The file must contain the group, plot, subplot and curve hierarchy with nonempty labels. The curve must contain a curve ID (c0) and the data identification.

Please note that the data ID will in general change each time a new database is generated. Use property in TP to acquire a valid ID pair.

Appendix B Simson menu tables: Column descriptions

This section gives a description of the data columns in the track table (chapter 8) and transmission table (chapter 9).

The track table

Column name	Description
Show	Indicates whether the track will be displayed in Maria or not.
Unit name	The units name
Label	The label that is generated for this track.
Origin	Where the track has originated from, sonar or system.
Start time	The time when the track was set up.
Stop time	The time when the track was lost.
Duration	Time between start and stop.
Length	The number of pings in this track.
Min latitude	The minimum latitude for the track
Max latitude	The maximum latitude for the track
Min longitude	The minimum longitude for the track
Max longitude	The maximum longitude for the track

The transmission table

Column name	Description
Tx Id	Database Id for the transmission.
Time	Time of ping.
Settings Id	Which settings ID valid for current ping.
TxPower	Transmission power
TxRange	Transmission range.
Tilt	Tilt of sonar.
Coverage	Coverage of sonar pulse.
System Mode	Sonar system mode.
TxMode	Transmission mode.
Multipulse Mode	Multipulse mode.
FM Shape	Shape of the FM pulse.
FM Tx Freq	Transmission frequency for FM pulse.
FM Pulse Length	Length of FM pulse.
FM Bandwidth	FM bandwidth.
CW shape	Shape of the CW pulse.
CW Tx Freq	Transmission frequency for CW pulse.

CW Pulse Length	Length of CW pulse.
SCW Pulse Length	Length of short CW pulse.
SFM Pulse Count	Number of stepped FM pulses.
SFM Pulse Length	Length of stepped FM pulse.
System State	The sonar system state.
Audio Bearing	True bearing of audio.
Tilt Scan Valid	Indicates whether or not tilt scan was used.
Tilt Step	The tilt step during a tilt scan.
Max Tilt	The maximum value for tilt during a tilt scan.
Min Tilt	The minimum value for tilt during a tilt scan.
Bearing	True bearing for the transmission.
Course	Not applicable.
Velocity	The ships velocity.
Track	Track number (if applicable).
MCC	Maintained close contact. Indicates whether or not the sonar maintained close contact with the target.